FINAL SCOPING REPORT

FOR THE PROPOSED TOWNSHIP ESTABLISHMENT ON PORTION OF FARM KLIPFONTEIN 716 AND FARM CERES 626 WITHIN THE MANGAUNG METROPOLITAN MUNICIPALITY

JULY 2020

DESTEA EMS/15/20/01 AND FSP/EIA/0000339/2020

Prepared For:

Department of Economic Small Business Development, Tourism and Environment Affairs (DESTEA).

Prepared By:

Inaluk Consulting Services

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Report Tittle : Final scoping report for the Proposed Mangaung Township

Place and Date : Pretoria July 2020

PROPONENT

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DECLARATION OF INDEPENDENCE
I, Kulani Nkuna as authorised representative of Inaluk Consulting Services hereby confirm my independence as an Environmental Assessment Practitioner and declare that neither I nor Inaluk Consulting Services have any interest, be it business, financial, personal or other, in any proposed activity, application or appeal in respect of which Inaluk Consulting Services was appointed as Environmental Assessment Practitioner in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998), other than fair remuneration for worked performed, specifically in connection with the Environmental Authorisation process for the Ladysmith Township extension 61.

Signature……  **……. Date……July 2020…….**

(For official use only)

File Reference Number:	
Application Number:	
Date Received:	

Basic assessment report in terms of the Environmental Impact Assessment Regulations, 2014, promulgated in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended.

Kindly note that:

1. This **environmental impact assessment report** is a standard report that may be required by a competent authority in terms of the EIA Regulations, 2014 as amended and is meant to streamline applications. Please make sure that it is the report used by the particular competent authority for the activity that is being applied for.
2. This report format is current as of **07 April 2017**. It is the responsibility of the applicant to ascertain whether subsequent versions of the form have been published or produced by the competent authority
3. The report must be typed within the spaces provided in the form. The size of the spaces provided is not necessarily indicative of the amount of information to be provided. The report is in the form of a table that can extend itself as each space is filled with typing.
4. Where applicable **tick** the boxes that are applicable in the report.
5. An incomplete report may be returned to the applicant for revision.
6. The use of "not applicable" in the report must be done with circumspection because if it is used in respect of material information that is required by the competent authority for assessing the application, it may result in the rejection of the application as provided for in the regulations.
7. This report must be handed in at offices of the relevant competent authority as determined by each authority.
8. No faxed or e-mailed reports will be accepted.
9. The signature of the EAP on the report must be an original signature.
10. The report must be compiled by an independent environmental assessment practitioner.
11. Unless protected by law, all information in the report will become public information on receipt by the competent authority. Any interested and affected party should be provided with the information contained in this report on request, during any stage of the application process.
12. A competent authority may require that for specified types of activities in defined situations only parts of this report need to be completed.

13. Should a specialist report or report on a specialised process be submitted at any stage for any part of this application, the terms of reference for such report must also be submitted.
14. Two (2) colour hard copies and one (1) electronic copy of the report must be submitted to the competent authority.
15. Shape files (.shp) for maps must be included in the electronic copy of the report submitted to the competent authority.

SECTION A: ACTIVITY INFORMATION

Has a specialist been consulted to assist with the completion of this section?	YES	NO

If YES, please complete the form entitled "Details of specialist and declaration of interest" for the specialist appointed and attach in Appendix I.

1. PROJECT DESCRIPTION

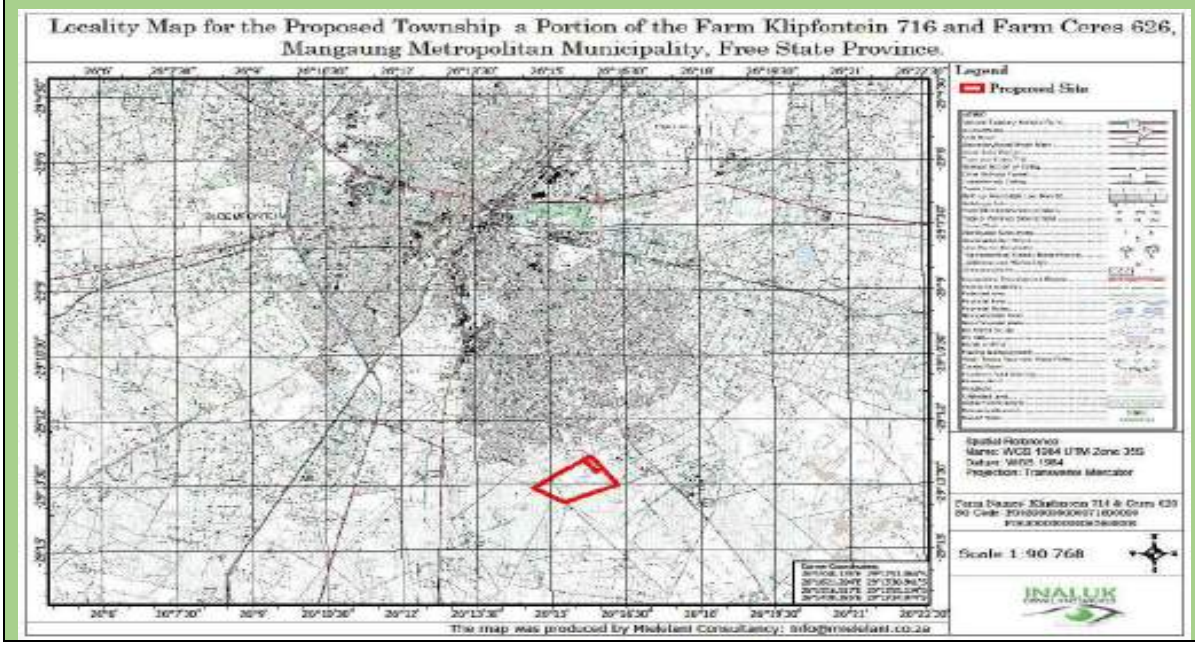
a) Describe the project associated with the listed activities applied for

The Mangaung Local Municipality is proposing to establish a new township development covering an area of approximately of 232,4 hectares in Mangaung, Free State Province. The proposed development is located on the Klipfontein 716 and farm Ceres 626. The site can be accessed from the Dewetsdorp Road and the M30, the said property is approximately 17 km outside Bloemfontein central with the following coordinates: 29° 12' 55.95" S and 26° 15' 51.58" E. The development will entail the provision of services to enable the proposed development of the Mangaung Mixes used Township which will consist of the following infrastructure:

- Residential stands
- Institutional stands
- Recreational
- Educational
- Municipal
- Place of worship
- Public open spaces

The Scoping and EIA Process is being undertaken in terms of the National Environmental Management Act (Act no. 107 of 1998) (NEMA) read with the Environmental Impact Assessment Regulations, 2017 (GNR 326 of 7 April 2017).

Locality Map



Layout Evaluated

Layout Alternative (Preferred Alternative)

Due to land availability and service connections, the proposed site is the only site that has been identified for establishing a township during the consultation process with the Local Municipality. Therefore, no alternative site has been identified or considered during this study.

b) Provide a detailed description of the listed activities associated with the project as applied for

Listed activity as described in GN 327,325 and 324	Description of project activity
Example: ***GN 327 Item xx xx): The construction of a bridge where such construction occurs within a watercourse or within 32 metres of a watercourse, measured from the edge of a watercourse, excluding where such construction will occur behind the development setback line.***	***A bridge measuring 5 m in height and 10m in length, no wider than 8 meters will be built over the Orange river***
GNR 325 of 7 April 2017 The clearance of an area of 20 hectares or more of indigenous vegetation, where such clearance of indigenous vegetation is required for (i)Undertaking of a linear activity; or (ii)Maintenance purposes undertaken in accordance with a maintenance management plan	The clearance of more than 200 hectares of land for the establishment of the various land uses on 232,4 hectares of land on the farm Klipfontein 716 and Ceres 626. This clearance is for the development of a township and provision of services

2. FEASIBLE AND REASONABLE ALTERNATIVES

"alternatives", in relation to a proposed activity, means different means of meeting the general purpose and requirements of the activity, which may include alternatives to—

(a) the property on which or location where it is proposed to undertake the activity;
(b) the type of activity to be undertaken;
(c) the design or layout of the activity;
(d) the technology to be used in the activity;
(e) the operational aspects of the activity; and
(f) the option of not implementing the activity.

Describe alternatives that are considered in this application as required by Appendix 1 (3)(h) of GN 326, Regulation 2014 as amended. Alternatives should include a consideration of all possible means by which the purpose and need of the proposed activity (NOT PROJECT) could be accomplished in the specific instance taking account of the interest of the applicant in the activity. The no-go alternative must in all cases be included in the assessment phase as the baseline against which the impacts of the other alternatives are assessed.

The determination of whether site or activity (including different processes, etc.) or both is appropriate needs to be informed by the specific circumstances of the activity and its environment. After receipt of this report the, competent authority may also request the applicant to assess additional alternatives that could possibly accomplish the purpose and need of the proposed activity if it is clear that realistic alternatives have not been considered to a reasonable extent.

The identification of alternatives should be in line with the Integrated Environmental Assessment Guideline Series 11, published by the DEA in 2004. Should the alternatives include different locations and lay-outs, the co-ordinates of the different alternatives must be provided. The co-ordinates should be in degrees, minutes and seconds. The projection that must be used in all cases is the WGS84 spheroid in a national or local projection.

a) Site alternatives

Alternative 1 (preferred alternative)		
Description	Lat (DDMMSS)	Long (DDMMSS)
The proposed development is located on the Klipfontein 716 and farm Ceres 626. The site can be accessed from the Dewetsdorp Road and the M30, the said property is approximately 17 km outside Bloemfontein central with the following coordinates: 29° 12' 55.95" S and 26° 15' 51.58" E. Due to land availability and service connections, the proposed site is the only site that has been identified for establishing a township during the consultation process with the Local Municipality. Therefore, no alternative site has been identified or considered during this study.	**29° 12' 55.95" S**	**26° 15'51.58" E.**
Alternative 2		

Description	Lat (DDMMSS)	Long (DDMMSS)
Due to land availability and service connections, the proposed site is the only site that has been identified for establishing a township during the consultation process with the Local Municipality. Therefore, no alternative site has been identified or considered during this study.		
Alternative 3		
Description	Lat (DDMMSS)	Long (DDMMSS)
Due to land availability and service connections, the proposed site is the only site that has been identified for establishing a township during the consultation process with the Local Municipality. Therefore, no alternative site has been identified or considered during this study.		

In the case of linear activities:

Alternative: N/A	**Latitude (S):**	**Longitude (E):**
Alternative S1 (preferred)		
• Starting point of the activity		
• Middle/Additional point of the activity		
• End point of the activity		
Alternative S2 (if any)		
• Starting point of the activity		
• Middle/Additional point of the activity		
• End point of the activity		
Alternative S3 (if any)		
• Starting point of the activity		
• Middle/Additional point of the activity		
• End point of the activity		

For route alternatives that are longer than 500m, please provide an addendum with co-ordinates taken every 250 meters along the route for each alternative alignment.

In the case of an area being under application, please provide the co-ordinates of the corners of the site as indicated on the lay-out map provided in Appendix A of this form.

b) Lay-out alternatives

Alternative 1 (preferred alternative)		
Description	Lat (DDMMSS)	Long (DDMMSS)
The below layout allows for 4001 development stands on 232,4 hectares with a highway that traverses through the proposed township	**29° 12' 55.95" S**	**26° 15'51.58" E.**

		
Alternative 2		
Description	Lat (DDMMSS)	Long (DDMMSS)
The below layout allows for 4022 development stands on 214,1 hectares with a highway that traverses through the proposed township 	**29° 12' 55.95" S**	**26° 15'51.58" E.**
Alternative 3		
Description	Lat (DDMMSS)	Long (DDMMSS)
No third alternative considered for the project layout		

c) Technology alternatives

Alternative 1 (preferred alternative)
N/A

Alternative 2
N/A
Alternative 3
N/A

d) Other alternatives (e.g. scheduling, demand, input, scale and design alternatives)

Alternative 1 (preferred alternative)		
Scheduling alternative These are also known as sequencing or phasing alternative. In essence, this means rescheduling parts of an activity to occur at times when impacts are less. In this case an activity may comprise a number of components, which can be scheduled in a different order or at different times and as such produce different impacts. For example, activities that produce noise could be from 06:00 to 18:00 to minimise impacts. **Input alternative** Input alternative is most applicable where different raw materials or energy sources will be utilised. In this proposed project alternatives that could be considered could be using solar energy for power supply and using ground water for water supply to reduce the pressure from the Mangaung Metropolitan Municipality to supply service. **Design and Layout alternative** The design and the layout of the development must take into consideration the type of slope of the site, especially during the construction phase so that no excessive dust particles are emitted, as it may have serious negative impacts among workers and the local residents. The Mangaung Metropolitan Municipality has identified Engineering designers who will be responsible for designing the development so as to avoid unpleasant aesthetic impacts which may be unacceptable to the community. **Demand alternative** Demand Alternative occurs when the demand for housing can be met by alternative means. Establishment of township will reduce the demand of housing to people of Mangaung. If the demand of service increase beyond the capacity of housing then operational cost will also increase. **Process alternative**		

The process alternative is also an engineering issue, therefore the Mangaung Metropolitan Municipality has appointed a specialist to assist in identifying the process alternative and has considered both technology and equipment alternatives to achieve the same goal.		
Alternative 2		
N/A		
Alternative 3		
N/A		

e) No-go alternative

The no-go alternative is the option of not developing the proposed development and its associated infrastructure. The land on the portion of farm Klipfontein 716 and farm Ceres 626 will remain undeveloped. The no development option would result in a lost opportunity in terms of the employment opportunities associated with the construction and operation phase as well as the benefits associated with the provision of houses, schools and other much needed social facilities. A high negative socio-economic impact significance would occur if the proposed development is not constructed. The "no-go" alternative will however result in the negative visual environment staying the same with the natural character of the area contributing to the "sense of place". If the development proposal is not authorised the current natural parts will remain largely impacted by illegal waste dumping which is clearly a negative factor for the biodiversity in the area. The socio-economic benefits of this project however largely outweigh the impacts in an area The No-Go Alternative is therefore not recommended

Paragraphs 3 – 13 below should be completed for each alternative.

3. PHYSICAL SIZE OF THE ACTIVITY

a) Indicate the physical size of the preferred activity/technology as well as alternative activities/technologies (footprints):

Alternative:	**Size of the activity:**
Alternative A1[1] (preferred activity alternative)	232,4 Ha
Alternative A2 (if any)	214,1 Ha
Alternative A3 (if any)	m^2

or, for linear activities: N/A

Alternative:	**Length of the activity:**
Alternative A1 (preferred activity alternative)	N/A m
Alternative A2 (if any)	N/A m
Alternative A3 (if any)	N/A m

[1] "Alternative A.." refer to activity, process, technology or other alternatives.

b) Indicate the size of the alternative sites or servitudes (within which the above footprints will occur):

Alternative:	**Size of the site/servitude:**
Alternative A1 (preferred activity alternative)	232,4 Ha
Alternative A2 (if any)	214,1 Ha
Alternative A3 (if any)	m^2

4. SITE ACCESS

Does ready access to the site exist?	YES	NO
If NO, what is the distance over which a new access road will be built		N/A m

Describe the type of access road planned:

The site can be accessed from the Dewetsdorp Road and the R720/ M30 into three additional roads that have been proposed (2 collector roads and an arterial road) that will subdivide the proposed development into 3 equal sites. There three proposed roads will be spaced at a distance of 450m from the Dewetsdort road.

Include the position of the access road on the site plan and required map, as well as an indication of the road in relation to the site.

5. LOCALITY MAP

An A3 locality map must be attached to the back of this document, as Appendix A. The scale of the locality map must be relevant to the size of the development (at least 1:50 000. For linear activities of more than 25 kilometres, a smaller scale e.g. 1:250 000 can be used. The scale must be indicated on the map.). The map must indicate the following:

- an accurate indication of the project site position as well as the positions of the alternative sites, if any;
- indication of all the alternatives identified;
- closest town(s;)
- road access from all major roads in the area;
- road names or numbers of all major roads as well as the roads that provide access to the site(s);
- all roads within a 1km radius of the site or alternative sites; and
- a north arrow;
- a legend; and
- locality GPS co-ordinates (Indicate the position of the activity using the latitude and longitude of the centre point of the site for each alternative site. The co-ordinates should be in degrees and decimal minutes. The minutes should have at least three decimals to ensure adequate accuracy. The projection that must be used in all cases is the WGS84 spheroid in a national or local projection.

6. LAYOUT/ROUTE PLAN

A detailed site or route plan(s) must be prepared for each alternative site or alternative activity. It must be attached as Appendix A to this document.

The site or route plans must indicate the following:

- the property boundaries and numbers of all the properties within 50 metres of the site;
- the current land use as well as the land use zoning of the site;
- the current land use as well as the land use zoning each of the properties adjoining the site or sites;
- the exact position of each listed activity applied for (including alternatives);
- servitude(s) indicating the purpose of the servitude;
- a legend; and
- a north arrow.

7. SENSITIVITY MAP

The layout/route plan as indicated above must be overlain with a sensitivity map that indicates all the sensitive areas associated with the site, including, but not limited to:

- watercourses;
- the 1:100-year flood line (where available or where it is required by DWS);
- ridges;
- cultural and historical features;
- areas with indigenous vegetation (even if it is degraded or infested with alien species); and
- critical biodiversity areas.

The sensitivity map must also cover areas within 100m of the site and must be attached in Appendix A.

8. SITE PHOTOGRAPHS

Colour photographs from the centre of the site must be taken in at least the eight major compass directions with a description of each photograph. Photographs must be attached under Appendix B to this report. It must be supplemented with additional photographs of relevant features on the site, if applicable.

9. FACILITY ILLUSTRATION

A detailed illustration of the activity must be provided at a scale of at least 1:200 as Appendix C for activities that include structures. The illustrations must be to scale and must represent a realistic image of the planned activity. The illustration must give a representative view of the activity.

10. ACTIVITY MOTIVATION

Motivate and explain the need and desirability of the activity (including demand for the activity):

1. Is the activity permitted in terms of the property's existing land use rights?	YES	NO	Please explain
The current land zoning for the area is currently for agriculture. A SPLUMA application is being lodged by Ngoti Town planners for the zoning to change in the with the various land uses for the proposed development			
2. Will the activity be in line with the following?			
(a) Provincial Spatial Development Framework (PSDF)	YES	NO	Please explain
This project is in line with PSDF Pillar 2: Spatial Planning - Integrated spatial planning and land use management in line with Category D of the special planning categories (Dm) Mixed used developments			
(b) Urban edge / Edge of Built environment for the area	YES	NO	Please explain
(c) Integrated Development Plan (IDP) and Spatial Development Framework (SDF) of the Local Municipality (e.g. would the approval of this application compromise the integrity of the existing approved and credible municipal IDP and SDF?).	YES	NO	Please explain
The MLM believes the principles call for the emergence of settlement patterns which create benefits accessible to the people of Mangaung. For this approach to be realised all settlements in Mangaung should strive to achieve the following qualities: • To generate a wide range of economic opportunities; • To be convenient to inhabitants to conduct their daily activities, easily and as inexpensively as possible, • To offer a choice of living conditions to all, • To be equitable in the sense that all inhabitants have reasonable access to the opportunities and facilities which support living in settlements, • To promote the efficient use of resources, and • To give dignity to people through the quality of the public spatial environment. The proposed development meets all the principles mentioned above for settlements opportunities. Part of this proposed development forms part of the SDF for mangaung see attached communication form the services report.			
(d) Approved Structure Plan of the Municipality	YES	NO	Please explain
The municipality aims to improve the following Housing backlogs and incomplete housing projects; Illegal settlements and land invasions in areas/lands Accelerating development of seven (7) land parcels with mixed development trajectory ;			

(e) An Environmental Management Framework (EMF) adopted by the Department (e.g. Would the approval of this application compromise the integrity of the existing environmental management priorities for the area and if so, can it be justified in terms of sustainability considerations?)	YES	NO	Please explain
The priority areas for Free state include the following areas large area of Mesic Highveld Grasslands and Drakensberg Grasslands in the eastern Free State which are important for ecosystem service delivery. There is a central and southern band of priority areas targeting very under-protected Dry Highveld Grasslands, and then a smaller set of areas in the west targeting the upper Nama-Karoo and Eastern Kalahari Bushveld.			
(f) Any other Plans (e.g. Guide Plan)	YES	NO	Please explain
3. 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 (i.e. is the proposed development in line with the projects and programmes identified as priorities within the credible IDP)?	YES	NO	Please explain
This proposed development is in line with the IDP and the area has no critical environmental sensitivities. the project is also funded by a grand to fulfil the commitments of the IPD by the municipality to address issues of informal settlements and access to housing and other institutional areas			
4. Does the community/area need the activity and the associated land use concerned (is it a societal priority)? (This refers to the strategic as well as local level (e.g. development is a national priority, but within a specific local context it could be inappropriate.)	YES	NO	Please explain
The proposed development will aim at addressing the need for social housing and formal settlements from the adjacent informal settlements			
5. Are the necessary services with adequate capacity currently available (at the time of application), or must additional capacity be created to cater for the development? (Confirmation by the relevant Municipality in this regard must be attached to the final Basic Assessment Report as Appendix I.)	YES	NO	Please explain
The proposed water demand for the proposed development is estimated to be 6060.90 KL/day and 4416.64 KL and the municipality is still in the process of confirming available capacity for the proposed demands. should there be inadequate capacity there will be a need to improve			

6. 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)? (Comment by the relevant Municipality in this regard must be attached to the final Basic Assessment Report as Appendix I.)	YES	NO	Please explain
The MLM in their IDP have identified infrastructure programmes as follows that will improve services Adequate budgeting for implementation to Water Demand Management; • Partnering with government to embark on a project to ensure reliable water supply _ explore a pipeline sourcing water from Gariep Dam • Water Conservation and harvesting of water			
7. Is this project part of a national programme to address an issue of national concern or importance?	YES	NO	Please explain
The project aims at addressing issue address in the national development plan			
8. Do location factors favour this land use (associated with the activity applied for) at this place? (This relates to the contextualisation of the proposed land use on this site within its broader context.)	YES	NO	Please explain
The current proposed land use will be beneficial as currently the land is degraded by illegal dumping of waste from the informal settlements. the development of this land will improve the state of the environment as it is as well as visual impacts associated with the waste dumping in close proximity to the R702 road			
9. Is the development the best practicable environmental option for this land/site?	YES	NO	Please explain
Yes, the development has created buffers to areas high sensitivity in the area being the dam and the wetland area on the south western boundary of the development. with the protection of these resources then all other proposed land uses within this area will be best for the larger environment. the area has no other sensitivities other than the wetland area			
10. Will the benefits of the proposed land use/development outweigh the negative impacts of it?	YES	NO	Please explain
The proposed development will address the following issues with the development being approved • Social housing • Access to schools • Access to government institutions • Reduce littering • Reduce land invasion through informal settlements evident in the surrounding area • Improved infrastructure system through the proposed N6 highway by SANRAL			

11. Will the proposed land use/development set a precedent for similar activities in the area (local municipality)?	YES	NO	Please explain
The proposed development will prompt other developments in the area as there will be decentralisation of services into the main central business areas of the Mangaung metropolitan area which will benefit the society in having access to services in close proximity. it will also improve and aid in more business opening in the areas			
12. Will any person's rights be negatively affected by the proposed activity/ies?	YES	NO	Please explain
The development will benefit the local residents as they will have better access to school and other institutional areas proposed with this development. there will also be job opportunities with the development of this project during the construction phase of the development.			
13. Will the proposed activity/ies compromise the "urban edge" as defined by the local municipality?	YES	NO	Please explain
14. Will the proposed activity/ies contribute to any of the 17 Strategic Integrated Projects (SIPS)?	YES	NO	Please explain
The project contributes to SIP 7 Integrated urban space and public transport programme Coordinate planning and implementation of public transport, human settlement, economic and social infrastructure and location decisions into sustainable urban settlements connected by densified transport corridors. This will focus on the 12 largest urban centres of the country, including all the metros in South Africa. Significant work is underway on urban transport integration.			
15. What will the benefits be to society in general and to the local communities?			Please explain
The community will benefit from access to better social housing and basic services such as schools			
16. Any other need and desirability considerations related to the proposed activity?			Please explain
The development will address the issue of resettlement of people in informal settlements. there is also a high risk of encroachment on this land should the development not be approved as planned for by the MLM.			

17. How does the project fit into the National Development Plan for 2030?	Please explain
This project fits into the NDP for 2030 as the MLM plans on the following as part of the NDP • Upgrade all informal settlements on suitable, well located land by 2030. • Reform the current planning system for improved coordination. • Develop a strategy to densify cities, promote better located housing and settlements. • Ensure safe, reliable and affordable public transport. • Provide SDF norms, including improving the balance between location of jobs and people. • Review of the grant and subsidy regime for housing • Provide incentives for citizen participation for local planning and development of spatial compacts. • Introduce mechanisms that would make land markets work more effectively for the poor and support rural and urban livelihoods.	
18. Please describe how the general objectives of Integrated Environmental Management as set out in section 23 of NEMA have been considered.	
All possible impacts that may both form a positive and negative ROD have been considered in the impact assessment of the project (see section F) impact assessment. the public participation process has also been initiated to identify all parties that me be affected or have an interest to the prosed development through sending a request to register on local newspaper as well as placement of site notices where the general public would be engaged and issues that they may have discussed in detail. Specialist have also been appointed to conduct impact assessments that would advise on sensitive areas of the development and where impacts arise advise on mitigation measures to be implemented throughout the project lifecycle .	
19. Please describe how the principles of environmental management as set out in section 2 of NEMA have been considered.	
Specialist have been considered in the various subject matters of the proposed development as well as relevant legislation governing the proposed development so that all statutory requirements are fulfilled	

11. APPLICABLE LEGISLATION, POLICIES AND/OR GUIDELINES

List all legislation, policies and/or guidelines of any sphere of government that are applicable to the application as contemplated in the EIA regulations, if applicable:

Title of legislation, policy or guideline	Applicability to the project	Administering authority	Date
Constitution of the Republic of South Africa 108 of 1996	Constitution makes provision for access to safe environment, housing and education	Mangaung Metropolitan municipality	1996
Municipal Systems Act 32 of 2000	Provision of proper settlements and utilities infrastructure	Mangaung Metropolitan municipality	2000
Spatial Planning and Land	Provision of land for township	Mangaung	2013

Use Management Act 16 of 2013	establishment	Metropolitan municipality	
Mangaung Metropolitan Municipality draft built environment performance plan (BEPP	Township development	Metropolitan municipality	2019/2020 – 2020/21
Metropolitan Spatial Development Framework	Township development	Metropolitan municipality	
Spatial Development Framework	Township development	Metropolitan municipality	2005 –06

12. WASTE, EFFLUENT, EMISSION AND NOISE MANAGEMENT

a) Solid waste management

Will the activity produce solid construction waste during the construction/initiation phase?

YES	NO

If YES, what estimated quantity will be produced per month?

Not able to predict at this stage of the projec

How will the construction solid waste be disposed of (describe)?

All construction waste such as building rubble, general waste will be disposed off in the correct waste skips with proper waste separation for disposal at the various landfill sites. Where possible any waste that must be recycled will be recycled at licenced facilities

Where will the construction solid waste be disposed of (describe)?

The construction rubble will be disposed at the rubble disposal facility located in Mangaung. other waste streams such as general waste will be disposed at the general landfill sites

Will the activity produce solid waste during its operational phase?

YES	NO

If YES, what estimated quantity will be produced per month?

1337.25m^3/week

How will the solid waste be disposed of (describe)?

All solid waste that will be generated during the operation phase of the project will be directed to the Mangaung municipality landfill sites

If the solid waste will be disposed of into a municipal waste stream, indicate which registered landfill site will be used.

Southern Landfill is an option due to its proximity to site however the municipality needs to confirm

Where will the solid waste be disposed of if it does not feed into a municipal waste stream (describe)?

All waste during operation phase will be taken to municipal landfill site

If the solid waste (construction or operational phases) will not be disposed of in a registered landfill site or be taken up in a municipal waste stream, then the applicant should consult with the competent authority to determine whether it is necessary to change to an application for scoping and EIA.

Can any part of the solid waste be classified as hazardous in terms of the NEM:WA?	YES	NO

If YES, inform the competent authority and request a change to an application for scoping and EIA. An application for a waste permit in terms of the NEM:WA must also be submitted with this application.

Is the activity that is being applied for a solid waste handling or treatment facility?	YES	NO

If YES, then the applicant should consult with the competent authority to determine whether it is necessary to change to an application for scoping and EIA. An application for a waste permit in terms of the NEM:WA must also be submitted with this application.

b) Liquid effluent

Will the activity produce effluent, other than normal sewage, that will be disposed of in a municipal sewage system?	YES	NO
If YES, what estimated quantity will be produced per month?	m^3	
Will the activity produce any effluent that will be treated and/or disposed of on site?	YES	NO

If YES, the applicant should consult with the competent authority to determine whether it is necessary to change to an application for scoping and EIA.

Will the activity produce effluent that will be treated and/or disposed of at another facility?	YES	NO

If YES, provide the particulars of the facility:

Facility name:			
Contact person:			
Postal address:			
Postal code:			
Telephone:		**Cell:**	
E-mail:		**Fax:**	

Describe the measures that will be taken to ensure the optimal reuse or recycling of waste water, if any:

All waste water that will be generated will be in the form of sewerage from the operational phase of the proposed development. This waste will be connected and disposed to municipal sewer system .

c) Emissions into the atmosphere

Will the activity release emissions into the atmosphere other that exhaust emissions and dust associated with construction phase activities?	YES	NO
If YES, is it controlled by any legislation of any sphere of government?	YES	NO

If YES, the applicant must consult with the competent authority to determine whether it is necessary to change to an application for scoping and EIA.

If NO, describe the emissions in terms of type and concentration:

The only emission that will result form the construction phase of the proposed development which will be dust from movement of heavy machinery .

d) Waste permit

Will any aspect of the activity produce waste that will require a waste permit in terms of the NEM:WA?	YES	NO

If YES, please submit evidence that an application for a waste permit has been submitted to the competent authority

e) Generation of noise

Will the activity generate noise?	YES	NO
If YES, is it controlled by any legislation of any sphere of government?	YES	NO

Describe the noise in terms of type and level:

There will be no noise generating activities other than noise from the movement of construction equipment . this noise will not be for prolonged periods.

13. WATER USE

Please indicate the source(s) of water that will be used for the activity by ticking the appropriate box(es):

Municipal	Water board	Groundwater	River, stream, dam or lake	Other	The activity will not use water

If water is to be extracted from groundwater, river, stream, dam, lake or any other natural feature, please indicate the volume that will be extracted per month:		litres
Does the activity require a water use authorisation (general authorisation or water use license) from the Department of Water Affairs?	YES	NO

If YES, please provide proof that the application has been submitted to the Department of Water Affairs.

14. ENERGY EFFICIENCY

Describe the design measures, if any, which have been taken to ensure that the activity is energy efficient:

Energy measures such as LED lights and solar power will be considered for some of the institutional facilities of the project.

Describe how alternative energy sources have been considered or been built into the design of the activity, if any:

Alternative energy for the development include LED lights gas instalations and solar power for the township development.

SECTION B: SITE/AREA/PROPERTY DESCRIPTION

Important notes:

1. For linear activities (pipelines, etc) as well as activities that cover very large sites, it may be necessary to complete this section for each part of the site that has a significantly different environment. In such cases please complete copies of Section B and indicate the area, which is covered by each copy No. on the Site Plan.

Section B Copy No. (e.g. A): **N/A**

2. Paragraphs 1 - 6 below must be completed for each alternative.

3. Has a specialist been consulted to assist with the completion of this section? YES | NO

If YES, please complete the form entitled "Details of specialist and declaration of interest" for each specialist thus appointed and attach it in Appendix I. All specialist reports must be contained in Appendix D.

Property description/physical address:

Province	Free State
District Municipality	Mangaung Metropolitan Municipality
Local Municipality	Mangaung Metropolitan Municipality
Ward Number(s)	Ward 7
Farm name and number	farm Klipfontein 716 and farm Ceres 626,
Portion number	N/A
SG Code	F0030000000071600000 F0030000000062600000

Where a large number of properties are involved (e.g. linear activities), please attach a full list to this application including the same information as indicated above.

Current land-use zoning as per local municipality IDP/records:

The current land-use zoning as per Local Municipality is the farm land

In instances where there is more than one current land-use zoning, please attach a list of current land use zonings that also indicate which portions each use pertains to, to this application.

Is a change of land-use or a consent use application required? YES | NO

1. GRADIENT OF THE SITE

Indicate the general gradient of the site.

Alternative S1:

~~Flat~~	1:50 – 1:20	1:20 – 1:15	1:15 – 1:10	1:10 – 1:7,5	1:7,5 – 1:5	Steeper than 1:5

Alternative S2 (if any):

~~Flat~~	1:50 – 1:20	1:20 – 1:15	1:15 – 1:10	1:10 – 1:7,5	1:7,5 – 1:5	Steeper than 1:5

Alternative S3 (if any):

Flat	1:50 – 1:20	1:20 – 1:15	1:15 – 1:10	1:10 – 1:7,5	1:7,5 – 1:5	Steeper than 1:5

2. LOCATION IN LANDSCAPE

Indicate the landform(s) that best describes the site:

2.1 Ridgeline		2.4 Closed valley		2.7 Undulating plain / low hills	
2.2 Plateau		2.5 Open valley		2.8 Dune	
2.3 Side slope of hill/mountain		2.6 Plain	x	2.9 Seafront	
2.10 At sea					

3. GROUNDWATER, SOIL AND GEOLOGICAL STABILITY OF THE SITE

Is the site(s) located on any of the following?

	Alternative S1:		**Alternative S2 (if any):**		**Alternative S3 (if any):**	
Shallow water table (less than 1.5m deep)	YES	~~NO~~	YES	NO	YES	NO
Dolomite, sinkhole or doline areas	YES	~~NO~~	YES	NO	YES	NO
Seasonally wet soils (often close to water bodies)	~~YES~~	NO	~~YES~~	NO	YES	NO
Unstable rocky slopes or steep slopes with loose soil	YES	~~NO~~	YES	~~NO~~	YES	NO
Dispersive soils (soils that dissolve in water)	YES	~~NO~~	YES	~~NO~~	YES	NO
Soils with high clay content (clay fraction more than 40%)	YES	~~NO~~	YES	~~NO~~	YES	NO
Any other unstable soil or geological feature	YES	NO	YES	~~NO~~	YES	NO
An area sensitive to erosion	YES	NO	YES	~~NO~~	YES	NO

If you are unsure about any of the above or if you are concerned that any of the above aspects may be an issue of concern in the application, an appropriate specialist should be appointed to assist in the completion of this section. Information in respect of the above will often be available as part of the project information or at the planning sections of local authorities. Where it exists, the 1:50 000 scale Regional Geotechnical Maps prepared by the Council for Geo Science may also be consulted.

4. GROUNDCOVER

Indicate the types of groundcover present on the site. The location of all identified rare or endangered species or other elements should be accurately indicated on the site plan(s).

Natural veld - good condition[E]	~~Natural veld with scattered aliens[E]~~	Natural veld with heavy alien infestation[E]	Veld dominated by alien species[E]	Gardens
Sport field	Cultivated land	Paved surface	Building or other structure	~~Bare soil~~

If any of the boxes marked with an "[E] "is ticked, please consult an appropriate specialist to assist in the completion of this section if the environmental assessment practitioner doesn't have the necessary expertise.

5. SURFACE WATER

Indicate the surface water present on and or adjacent to the site and alternative sites?

Perennial River	YES	NO	UNSURE
Non-Perennial River	YES	NO	UNSURE
Permanent Wetland	~~YES~~	NO	UNSURE
Seasonal Wetland	YES	NO	UNSURE
Artificial Wetland	YES	~~NO~~	UNSURE
Estuarine / Lagoonal wetland	YES	~~NO~~	UNSURE

If any of the boxes marked YES or UNSURE is ticked, please provide a description of the relevant watercourse.

The sensitivity map indicated two (2) NFEPA wetland areas to be present on site. The National Wetland map5 (NWM5) and Free State Wetland Probability map data were used in determining the wetland areas during the desktop study. However, an additional artificial watercourse (Artificial watercourse 2) was identified during the site visit. The latter falls outside the scope area of the project.

6. LAND USE CHARACTER OF SURROUNDING AREA

Indicate land uses and/or prominent features that currently occur within a 500m radius of the site and give description of how this influences the application or may be impacted upon by the application:

Natural area	Dam or reservoir	Polo fields
Low density residential	Hospital/medical centre	Filling station [H]
Medium density residential	School	Landfill or waste treatment site
High density residential	Tertiary education facility	Plantation
Informal residential[A]	Church	Agriculture
Retail commercial & warehousing	Old age home	River, stream or wetland
Light industrial	Sewage treatment plant[A]	Nature conservation area
Medium industrial [AN]	Train station or shunting yard [N]	Mountain, koppie or ridge
Heavy industrial [AN]	Railway line [N]	Museum
Power station	Major road (4 lanes or more) [N]	Historical building
Office/consulting room	Airport [N]	Protected Area
Military or police base/station/compound	Harbour	Graveyard
Spoil heap or slimes dam[A]	Sport facilities	Archaeological site
Quarry, sand or borrow pit	Golf course	Other land uses (describe)

If any of the boxes marked with an "N "are ticked, how will this impact / be impacted upon by the proposed activity? Specify and explain:

N/A

If any of the boxes marked with an "An" are ticked, how will this impact / be impacted upon by the proposed activity? Specify and explain:

N/A

If any of the boxes marked with an "H" are ticked, how will this impact / be impacted upon by the proposed activity? Specify and explain:

N/A

Does the proposed site (including any alternative sites) fall within any of the following:

Critical Biodiversity Area (as per provincial conservation plan)	YES	~~NO~~
Core area of a protected area?	YES	~~NO~~
Buffer area of a protected area?	YES	~~NO~~
Planned expansion area of an existing protected area?	YES	~~NO~~
Existing offset area associated with a previous Environmental Authorisation?	YES	~~NO~~
Buffer area of the SKA?	YES	~~NO~~

If the answer to any of these questions was YES, a map indicating the affected area must be included in Appendix A.

7. CULTURAL/HISTORICAL FEATURES

Are there any signs of culturally or historically significant elements, as defined in section 2 of the National Heritage Resources Act, 1999, (Act No. 25 of 1999), including Archaeological or paleontological sites, on or close (within 20m) to the site? If YES, explain:	YES	NO
	Uncertain	

A water cistern, troughs and other modern ruins in the centre of the study area were noted. More modern ruins along the southern boundary of the study area was also identified. None of these are considered to be historically significant.

However, the site is located on a high Paleontological sensitivity underlain by the Adelaide Subgroup is Very High

If uncertain, conduct a specialist investigation by a recognised specialist in the field (archaeology or palaeontology) to establish whether there is such a feature(s) present on or close to the site. Briefly explain the findings of the specialist:

A heritage Impact Assessment was conducted and no structures of heritage importance were found in the area. Further consultation and assessments were investigated for Palaeontological assessments. No outcrops were identified during the site visit. However a chance protocol must be implemented

Will any building or structure older than 60 years be affected in any way?	YES	NO
Is it necessary to apply for a permit in terms of the National Heritage Resources Act, 1999 (Act 25 of 1999)?	YES	NO

If YES, please provide proof that this permit application has been submitted to SAHRA or the relevant provincial authority.

8. SOCIO-ECONOMIC CHARACTER

a) Local Municipality

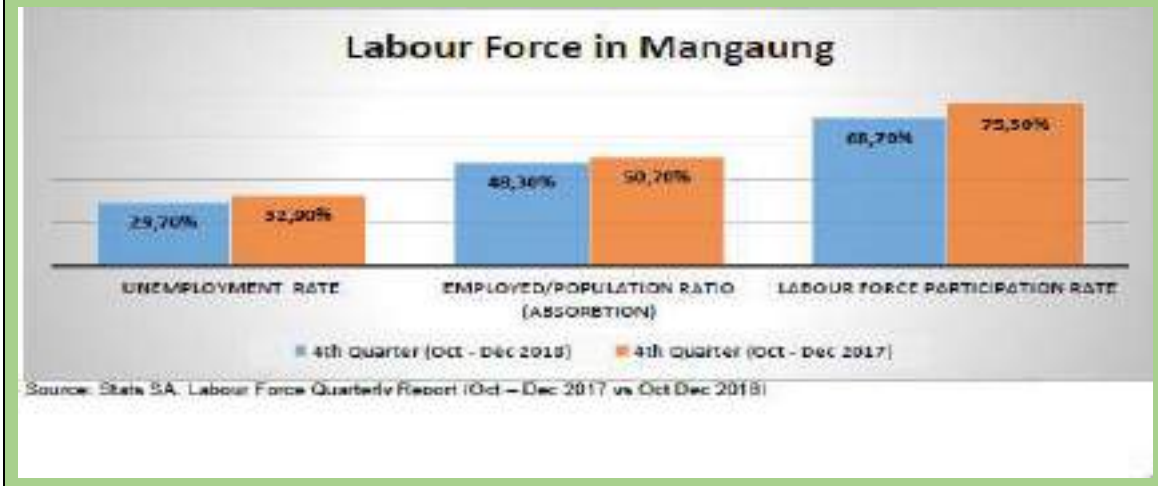
Please provide details on the socio-economic character of the local municipality in which the proposed site(s) are situated.

Level of unemployment:

In the case of Mangaung the following Table is key as a guide of how many people from which district are working on a gender basis. A note should be taken that there has not been any rigorous attempt to calculate the numbers since the incorporation of outlying towns in 2016.

Area	Male	Female	Total
Botshabelo	51 026	54 758	105 784
Bloemfontein	103 270	103 198	206 468
ThabaNchu	34 084	34 557	68 641
Soutpan	1 003	895	1 898
Dewetsdorp	14 297	13 200	27 497
Wepener	13 288	10 998	24 286
vanStadensrus	2 945	1 900	4 845

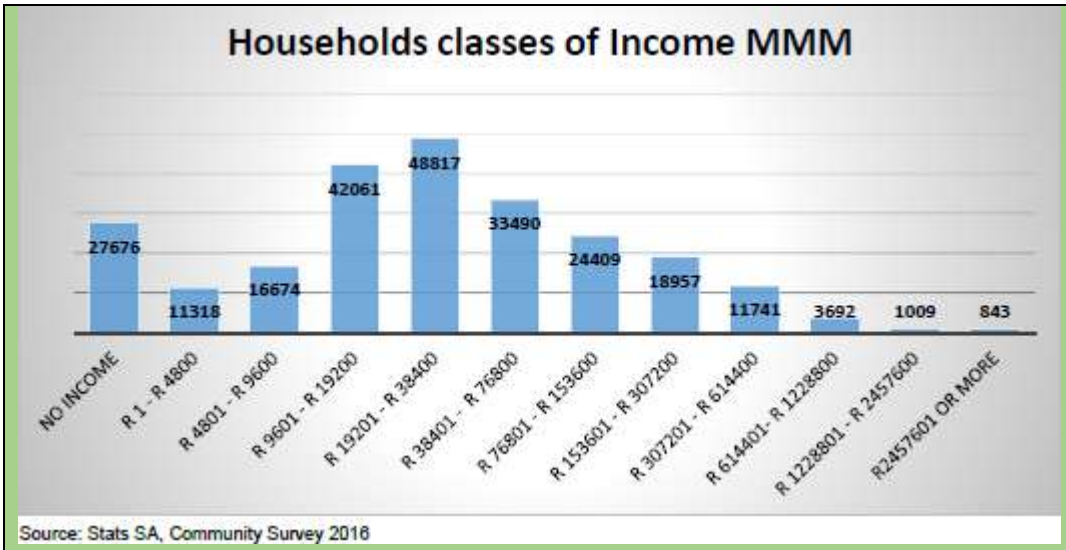
The above Table shows that in Mangaung more men are working than women and the biggest centre of employment remains Bloemfontein followed by Botshabelo. Approximately 439 500 people or 49% of the population in Mangaung are economically active. This number is twice the number of 260 900 that was recorded two decades ago and was 38% of the total population.



The unemployment rate fell by 3.2% in 2018 from 32.9% in 2017 which is encouraging, however the job loses where also recorded at 2.4% from the 50.7% in 2017 and economically active or looking for work fell by 6.8% from 75.5% in 2017.

Economic profile of local municipality:

In line with the merging of other towns the city has a total number of 265 414 households in Mangaung. The Economic Profile of the Mangaung metropolitan Municipality is summarized below. This project will contribute by providing new working opportunities during the construction phase.



Level of education:

According to the Community Survey, 2016, Mangaung Metropolitan Municipality has a population of approximately 787 930, and as far as the population distribution is concerned, more than half of the population is concentrated in the Bloemfontein area (63%), followed by Botshabelo (24%), Thaba Nchu (9%), Dewetsdorp and Wepener (1.5%) respectively with Soutpan (0.8%) and Van Stadensrus at (0.2%).

In this Case the project is situated at Dewetsdorp, ward 7.

Distribution of population (20 years and above) by level of education,340 have no schooling, 778 completed some primary education, 315 have completed primary,2385 have completed the secondary education, 1884 have completed Grdae 12/ std 10, 402 have completed higher education and 7 others have completed tertiary education.

b) Socio-economic value of the activity

What is the expected capital value of the activity on completion?	R TDB	
What is the expected yearly income that will be generated by or as a result of the activity?	R TDB	
Will the activity contribute to service infrastructure?	~~YES~~	NO
Is the activity a public amenity?	YES	~~NO~~
How many new employment opportunities will be created in the development and construction phase of the activity/ies?	TDB	
What is the expected value of the employment opportunities during the development and construction phase?	R TDB	
What percentage of this will accrue to previously disadvantaged individuals?	% TDB	
How many permanent new employment opportunities will be created during the operational phase of the activity?	TDB	

What is the expected current value of the employment opportunities during the first 10 years?	R TDB
What percentage of this will accrue to previously disadvantaged individuals?	% TDB

9. BIODIVERSITY

Please note: The Department may request specialist input/studies depending on the nature of the biodiversity occurring on the site and potential impact(s) of the proposed activity/ies. To assist with the identification of the biodiversity occurring on site and the ecosystem status consult http://bgis.sanbi.org or BGIShelp@sanbi.org. Information is also available on compact disc (cd) from the Biodiversity-GIS Unit, Ph (021) 799 8698. This information may be updated from time to time and it is the applicant/ EAP's responsibility to ensure that the latest version is used. A map of the relevant biodiversity information (including an indication of the habitat conditions as per (b) below) and must be provided as an overlay map to the property/site plan as Appendix D to this report.

a) Indicate the applicable biodiversity planning categories of all areas on site and indicate the reason(s) provided in the biodiversity plan for the selection of the specific area as part of the specific category)

Systematic Biodiversity Planning Category				**If CBA or ESA, indicate the reason(s) for its selection in biodiversity plan**
Critical Biodiversity Area (CBA)	Ecological Support Area (ESA)	Other Natural Area (ONA)	No Natural Area Remaining (NNR)	

b) Indicate and describe the habitat condition on site

Habitat Condition	**Percentage of habitat condition class (adding up to 100%)**	**Description and additional Comments and Observations (including additional insight into condition, e.g. poor land management practises, presence of quarries, grazing, harvesting regimes etc).**
Natural	60%	The footprint of the land on the proposed development is bare natural exposed soil, with little vegetation as some of the areas are used as grazing field. there is also a wetland area that present on the site property. A dam on the boundary area is also noted close to an old farm dam
Near Natural (includes areas with low to moderate level of alien invasive plants)	30%	On the boundary near the main road invader plants can be noted with a lot of litter from the informal settlements. This waste consists of general household waste and few rubble materials within the project area.
Degraded (includes areas heavily invaded by	0%	

alien plants)		
Transformed (includes cultivation, dams, urban, plantation, roads, etc)	10%	A gravel road is present through that site from the southern to northern boundary of the property that is currently being used

c) Complete the table to indicate:

(i) the type of vegetation, including its ecosystem status, present on the site; and

(ii) whether an aquatic ecosystem is present on site.

Terrestrial Ecosystems		**Aquatic Ecosystems**						
Ecosystem threat status as per the National Environmental Management: Biodiversity Act (Act No. 10 of 2004)	Critical	Wetland (including rivers, depressions, channelled and unchanneled wetlands, flats, seeps pans, and artificial wetlands)			Estuary		Coastline	
	Endangered							
	Vulnerable							
	Least Threatened	YES	NO	UNSURE	YES	NO	YES	NO

d) Please provide a description of the vegetation type and/or aquatic ecosystem present on site, including any important biodiversity features/information identified on site (e.g. threatened species and special habitats)

Vegetation Type

The study area and project site is situated within the Grassland Biome and Dry Highveld Grassland bioregion. The proposed project area forms part of the (Gh5) Bloemfontein Dry Grassland vegetation type (Mucina & Rutherford, 2006).

The proposed project area also falls inside an area categorised by the Provincial Spatial Biodiversity Plan as 'Other" and "Degraded". 'Other Natural Areas' are production landscapes with the objectiveto manage land to optimize sustainable utilization of natural resources (Adapted from the guidelines for bioregional plans (Anon 2008)). See sensitivity and vegetation maps (Appendix A).

The distribution of the vegetation type as found on the site is limited to the Free State Province and can mainly be found at altitudes of 1250-1480m. This vegetation type has been described by Mucina and Rutherford (2009) to usually occur in landscape types such as undulating bottomland landscapes covered with tall, dense grassland alternating with patches of karroid schrubs.

The area is not ecologically important and sensitive at any scale. Biodiversity is usually ubiquitous and not sensitive to flow and habitat modifications. It is classified as a Degraded Area although the vegetation type (when in pristine condition) is classified as Endangered. At a local scale the site is degraded and poses very little significance ecologically. No species of conservation concern were found present or are likely expected to be present. The property is surrounded by transformed land cover, mainly housing and previous agricultural activities, making recovery to a functional and representative ecosystem unlikely and very slow.

Wetlands on site:

The sensitivity map indicated two (2) NFEPA wetland areas to be present on site. The National Wetland map5 (NWM5) and Free State Wetland Probability map data were used in determining the wetland areas during the desktop study. However, an additional artificial watercourse (Artificial watercourse 2) was identified during the site visit. The latter falls outside the scope area of the project.

Fauna evaluation and found on site:

No fauna other than Suricata suricatta (meerkat) was found at the site. Evaluating the area showed signs of animals present (manure and footprints). The latter mainly refer to introduced animals grazing on the premises.No listed dung beetles are found (DungBeetleMAP, 2019) in the QDS. No Neoroptera, Megaloptera, butterflies nor Odonata of conservation concern are known from the QDS (LacewingMAP, 2019; OdonataMAP, 2019; LepiMAP, 2019). Insects are mobile and can relocate from the development footprint to the adjacent intact vegetation. No listed spiders or scorpions are known to occur in the area and these species are presumed to move away from the construction site due to increased disturbance (ScorpionMAP & SpiderMAP, 2019). No amphibians or reptile of conservation concern are known from the QDS (FrogMAP, 2019; ReptileMAP, 2019).

Several mammals of conservation concern are known from the QDS (MammalMAP, 2019), but due to the agricultural and transformed matrix which surrounds the property there is a lack of suitable habitat for the species listed in Table 7. It is very unlikely that the property will provide a suitable habitat for these species. The grassland on the property can however by used by domestic animals and smaller roaming mammals, as seen from evidence of their presence, i.e. a small burrow, cow dung and small droppings. The property and direct surrounds has a relatively low habitat diversity. The impacts on fauna life is likely to be low because of the already degraded and surrounding areas. Grassland habitat of similar quality is available on the farm adjacent to the proposed development area.

SECTION C: PUBLIC PARTICIPATION

1. ADVERTISEMENT AND NOTICE

Publication name	Volksblad Local Newspaper. Notice of Environmental Impact Assessment (Scoping Process) for the proposed Township Establishment Development, Within Mangaung Metropolitan Municipality, Bloemfontein, Free State Province.	
Date published	Friday 22nd November 2019	
Site notice position	**Latitude**	**Longitude**
	29° 13'22,69'' S	26° 15'02,49''E
Date placed	08th November 2019	

Include proof of the placement of the relevant advertisements and notices in Appendix E1.

2. DETERMINATION OF APPROPRIATE MEASURES

Provide details of the measures taken to include all potential I&APs as required by Regulation 41(2)(e) and 41(6) of GN 326

Key stakeholders (other than organs of state) identified in terms of Regulation 41(2)(b) of GN 326

Title, Name and Surname	**Affiliation/ key stakeholder status**	**Contact details (tel number or e-mail address)**
Mrs M. Ramongalo	I&APs. Mangaung Metropolitan Municipality	**Tel:** 015 405 8429/ 051 405 8577 **Email:** Mpolokeng.Ramangalo@mangaung.co.za
Crl Rampai (Chabeli Frank)	I&APs. Mangaung Metropolitan Municipality Councilor	**Tel:** 083 5910 512 /063 6993 527 **Email:** frankrampaifr6@gmail.com
Mr Jack Morton	I&APs. Department of Agriculture Forestry and Fisheries	**Tel**:051 861 8369 /083 302 0703 **Email**: jack@fs.agric.za
Dr Redelstorf	I&APs. SAHRA	**Tel:** 021 462 4502 **Email**: rredelstorff@sahra.org.za
Mr Chris Smith	Department of Agriculture and Rural Development	**Tel:** 073 156 2740 **Email:** csmith@dard.gov.za
Mr C Pietersen	Department of water and sanitation	**Tel:** 015 405 9000 **Email:** pietersen@dws.gov.za
Thobile Duma	SANRAL	**Tel:** 033 392 8167 / 083 328 0989 **Email:** dumat@nra.co.za

Include proof that the key stakeholder received written notification of the proposed activities as Appendix E2. This proof may include any of the following:

- e-mail delivery reports;

- registered mail receipts;
- courier waybills;
- signed acknowledgements of receipt; and/or
- or any other proof as agreed upon by the competent authority.

3. ISSUES RAISED BY INTERESTED AND AFFECTED PARTIES

Summary of main issues raised by I&APs	Summary of response from EAP
Comments from Circulated BID	
Ragna Redelstorff Dated 15 November 2019. SAHRA Thank you for the notification. You are kindly reminded that SAHRA does not accept hardcopies, emails or website links as submissions. Please submit an application on the South African Heritage Resources Information System (SAHRIS). Please follow the step-by-step tutorial videos on the SAHRIS homepage (https://sahris.sahra.org.za) and upload all documents to the case file.	Noted.
Mrs. M. Ramongalo. Dated: 02 December 2019. Mangaung Metropolitan Municipality. Reference is made to your letter received by this office regarding the above-mentioned application. This office requests more information concerning the proposed activity on Farm Klipfontein 716 and farm Ceres 626 in order to give meaningful comments. A hard copy of the environmental reports must be submitted to this office for review and comments. In the report to be submitted it must clearly be demonstrated in which way the proposed development will meet the requirements of sustainable development. It must also consider energy efficient technologies and water saving devices and technologies for the proposed development. This could include measures such as recycling of waste, the use of low voltage or compact fluorescent light instead of incandescent globes, management of storm water, the capture and use of rainwater from gutter and roof and the use of locally indigenous vegetation during landscaping and the training of staff to implement good housekeeping technique light pollution, air quality, water use and solid waste management.	Noted The Draft Scoping and specialist Report will be send with all the information that you requested.
Mr. C Smith Dated: 28 November 2019. Department of Agriculture and Rural Development Reference is made to the comment received that the development is still agricultural land from their information and the land cannot be developed without re-zoning	The comment has been received and a application for re-zoning has been submitted and handled by Ngoti Development Consultants the

	appointed town planner
Comments from public meeting	
The site notice was placed on the 17th of November 2019, and the newspaper advert was published on the 22nd of November 2019 on the Volksblad Local Newspaper for the public meeting that was held on the 30th of November 2019. The community did not raise any comments nor attend the public meeting on the 30th of November 2019.	

4. COMMENTS AND RESPONSE REPORT

The practitioner must record all comments received from I&APs and respond to each comment before the Draft Scoping Report is submitted. The comments and responses must be captured in a comments and response report as prescribed in the EIA regulations and be attached to the Final BAR as Appendix E3.

5. AUTHORITY PARTICIPATION

Authorities and organs of state identified as key stakeholders:

Authority/Organ of State	**Contact person (Title, Name and Surname)**	**Tel No**	**Fax No**	**e-mail**	**Postal address**
Mangaung Metropolitan Municipality	Mrs M. Ramongalo	015 405 8429/ 051 405 8577		Mpolokeng.Ramangalo@mangaung.co.za	P O Box 3704 Bloemfontein 9300
Mangaung Metropolitan Municipality –Ward 7 Councillor	Crl Rampai (Chabeli Frank)	083 5910 512 /063 6993 527		frankrampaifr6@gmail.com	P O Box 3704 Bloemfontein 9300
Department of Agriculture Forestry and Fisheries	Mr Jack Morton	083 302 0703	086 234 6758	jack@fs.agric.za	Private Bag X01 Glen 9360
SAHRA	Dr Redelstorf	021 462 4502		rredelstorff@sahra.org.za	
SANRAL	Thobile Duma	033 392 8167	083 328 0989	**dumat@nra.co.za**	58 van Eck Place Mkondeni Pietermaritzburg KwaZulu-Natal 3200

Include proof that the Authorities and Organs of State received written notification of the proposed activities as appendix E4.

In the case of renewable energy projects, Eskom and the SKA Project Office must be included in the list of Organs of State.

6. CONSULTATION WITH OTHER STAKEHOLDERS

Note that, for any activities (linear or other) where deviation from the public participation requirements may be appropriate, the person conducting the public participation process may deviate from the requirements of that sub-regulation to the extent and in the manner as may be agreed to by the competent authority.

Proof of any such agreement must be provided, where applicable. Application for any deviation from the regulations relating to the public participation process must be submitted prior to the commencement of the public participation process.

A list of registered I&APs must be included as appendix E5.

Copies of any correspondence and minutes of any meetings held must be included in Appendix E6.

SECTION D: IMPACT ASSESSMENT

The assessment of impacts must adhere to the minimum requirements in the EIA Regulations, 2014 as amended and should take applicable official guidelines into account. The issues raised by interested and affected parties should also be addressed in the assessment of impacts.

1. IMPACTS THAT MAY RESULT FROM THE PLANNING AND DESIGN, CONSTRUCTION, OPERATIONAL, DECOMMISSIONING AND CLOSURE PHASES AS WELL AS PROPOSED MANAGEMENT OF IDENTIFIED IMPACTS AND PROPOSED MITIGATION MEASURES

Provide a summary and anticipated significance of the potential direct, indirect and cumulative impacts that are likely to occur as a result of the planning and design phase, construction phase, operational phase, decommissioning and closure phase, including impacts relating to the choice of site/activity/technology alternatives as well as the mitigation measures that may eliminate or reduce the potential impacts listed. This impact assessment must be applied to all the identified alternatives to the activities identified in Section A(2) of this report.

Activity	Impact summary	Significance rating of impact before mitigation	Proposed mitigation	Significance rating of impact after mitigation
		Alternative 1 (preferred alternative)		
Identified Impacts- Planning and Design				
	Direct impacts:			
	Water Resources: The design of the township needs to consider the sensitive areas near water resources such as wetlands, dams and rivers**.**	**Medium (Negative)**	The design must incorporate buffers around these resources acceptable by the relevant guideline documents. the designs must ensure wherever applicable that these resources are not damaged, or degraded by the development	**Low**
	Cultural and Heritage Artefacts : the design of and subdivision on the stands must incorporate the heritage of the area that is of cultural importance or one that has or must be protected	**Medium**	A heritage impact assessment must be done in order to assess any artefacts that may be worth preservation as per the Heritage Act. The area is determined to have a high paleontological sensitivity and as such the mitigation measures must be incorporated into the environmental Managent plan to be a guiding document	**Low**

Activity	Impact summary	Significance rating of impact before mitigation	Proposed mitigation	Significance rating of impact after mitigation
			during the construction phase of the project	
	Socio-Economic: The area where the proposed development will take place is adjacent an informal settlement, the project areas already is at risk of invasion by the adjacent development. This will cause degradation in land value	**High**	The proposed development has accommodated for social housing that will minimise the risk of land invasion and will also make provision of basic services and amenities	**Medium**
Identified Impacts- Construction Phase				
	Direct impacts:			
	Noise: Residents in the vicinity of the proposed development site will be subjected to increased noise nuisance (noise and vibration caused by construction machinery and equipment)	Medium(Negative)	Construction and other noise generating activities should be restricted to between 06h00 and 18h00 Monday to Friday, unless otherwise approved by the appropriate competent person in consultation with adjacent landowners/affected persons and ECO. During the operational phase all activities must take place in a manner that will allow as little noise as possible. Activities, which are deemed to generate high levels of noise, will be restricted to normal working hours.	Low (Negative)
	Soil Erosion: Exposed soil resulting from construction	Medium (Negative)	Mitigation measures include reducing the amount of exposed soil by means of selective soil stripping.	Low (Nagative)

Activity	Impact summary	Significance rating of impact before mitigation	Proposed mitigation	Significance rating of impact after mitigation
	activities is prone to erosion by water or wind. Stripping and stockpiling of topsoil could lead to erosion and degradation of soil quality.		Susceptible soil surfaces can be protected with mulch. Drainage channels must be monitored to ensure erosion doesn't occur. Only the minimal vegetation must be cleared.	
	Air Pollution: The proposed construction phase activities will affect air quality as a result of emissions caused by exhaust fumes and dust generation.	Medium (Negative)	The speed of vehicles within the site to be strictly controlled to between 30 - 45km/h. Areas generating dust particles should be sprinkled with water to reduce dust blowing out over the area and should be enclosed where possible to mitigate effects of wind on them. The clearing of vegetation should be limited to the development area and should be undertaken prior to the commencement of construction activities	Low (Negative)
	Soil Pollution The presence of machinery and vehicles on site during the construction phase may result in the occurrence of hydrocarbon spills or leakages. Improper practices when conducting maintenance on vehicles/machinery may also result in hydrocarbon spills contaminating the soil	Medium (Negative)	Vehicles and machinery must be well-maintained to ensure they do not result in oil or fuel leaks. Should maintenance of vehicles/machinery take place on site, this should be undertaken in a designated area that is paved.	Low (Negative)

Activity	Impact summary	Significance rating of impact before mitigation	Proposed mitigation	Significance rating of impact after mitigation
	Safety During the construction phase heavy machinery will be employed. The potential for accidents among operators exists if machinery is not handled properly. This is likely to have a negative impact on the health of the workers.	Medium (Negative)	Safety equipment must be provided to all employees to prevent personal injury during construction activities. This includes equipment such as protective eye and ear wear and protective clothing where necessary. Staff should be appropriately trained in all assigned activities. To limit the risk of accidents, safety procedures must be put in place and enforced by the foremen to ensure that vehicles and machinery only drive in designated places and are only driven by authorized personnel.	Low (Negative)
	Visual Impact Construction activities that, without mitigation, could give rise to visual impacts. The following temporary activities are included: •Presence of storage and stockpile areas, •Movements of construction machinery.	Medium (Negative)	The visual impacts of construction activities will be temporary	Low to Moderate (Negative)
	Waste Waste generation and disposal	Medium (Negative)	A waste management plan to be developed for the construction site. A plan to ensure that all waste is contained in suitable containers to prevent waste being washed into water	Low (Negative)

Activity	Impact summary	Significance rating of impact before mitigation	Proposed mitigation	Significance rating of impact after mitigation
			bodies. Containers for waste to ensure that any fluids generated by waste are trapped and can be disposed of in a suitable.	
	Fire	Medium (Negative	Contractor must make sure that there is supervision for all fires that are used in the construction camp. Smoking should be prohibited in the vicinity of flammable substances. The contractor should ensure that fire-fighting equipment is available on site, in particular where flammable substances are stored. Fires started for comfort (warmth) should be discouraged by the contractor, due to the risk of vegetation fires and risk to adjacent property. Fire-fighting equipment and emergency plans must be in place prior to the construction phase. The contractor will plan and implement a fire prevention programs and develop a contingency plan in the event of any	Low to Moderate (Negative)
	Indirect impacts:			
	Socio-economic impact: The proposed township	Low(Positive)	Employment opportunities should be offered to locals especially where non-skilled labour is concerned, this will	Medium (Positive)

Activity	Impact summary	Significance rating of impact before mitigation	Proposed mitigation	Significance rating of impact after mitigation
	establishment will have a positive impact on the local economy by supplying employment opportunities to locals and working there would supply them with skill development		give the locals some form of ownership of the project. Equal opportunities should be given to females, males, youth and the disabled. Payment should comply with applicable Labour Law legislation in terms of minimum wages	
	Cumulative impacts:			
	Identified Impacts Operational and maintenance Phase			
	Direct impacts:			
	Storm water management:		It is recommended that proper storm water drainage system be ensured during operation and maintenance phase. Storm water should not be allowed to discharge onto bare soil but must be diverted to the surrounding grasslands or to the landscaped gardens during the operational phase.	
	Waste generation and disposal	High (Negative)	Solid waste generated during operation and maintenance phase must be removed in a continuous and efficient manner to the satisfaction of the local municipality. A waste management plan to be developed and maintained for the construction site. No solid waste should be dumped on the site. All domestic waste generated on the site should be disposed	Low (Negative)

Activity	Impact summary	Significance rating of impact before mitigation	Proposed mitigation	Significance rating of impact after mitigation
			of in a proper manner off site i.e. no burial on site.	
	Maintenance of access roads:	Medium (Negative)	Maintenance of access roads: Access/ alternate roads to be maintained with an acceptable free of erosion, and no surface water ponding.	Low (Negative)
	Traffic:	High (Negative)	Any traffic disruptions due to the movement of heavy machinery should be undertaken with the approval of all relevant authorities and in accordance with all relevant legislation.	Low (Negative)
	Indirect impacts*:*			
	Socio-economic Impact: The proposed township establishment will have a positive impact on the local economy by supplying employment opportunities to locals and working there would supply them with skill development	Low (Positive)	Employment opportunities should be offered to locals especially where non-skilled labour is concerned, this will give the locals some form of ownership of the project. Equal opportunities should be given to females, males, youth and the disabled. Payment should comply with applicable Labour Law legislation in terms of minimum wages	Medium (Positive)
	Cumulative impacts:			
		Alternative 2		
N/A	***Direct impacts:***			
	Indirect impacts:			
	Cumulative impacts:			
	Direct impacts:			

Activity	Impact summary	Significance rating of impact before mitigation	Proposed mitigation	Significance rating of impact after mitigation
N/A	***Indirect impacts:***			
	Cumulative impacts:			
		Alternative 3		
N/A	***Direct impacts:***			
	Indirect impacts:			
	Cumulative impacts:			
N/A	***Direct impacts:***			
	Indirect impacts:			
	Cumulative impacts:			
		No-go option		
	Direct impacts: The no-go alternative is the option of not developing the proposed development and its associated infrastructure. The potential topsoil loss, vegetation loss and erosion potential from earthworks will be eliminated **Indirect impacts:** No indirect impacts for the project for the no-go option. **Cumulative impacts:** No Cumulative impact to be expected, due to the no-go alternative is the option of not developing the proposed development and its associated infrastructure, therefore no Cumulative impacts for the no-go option.			

A complete impact assessment in terms of Regulation 19(3) of GN 326 must be included as Appendix F.

2. ENVIRONMENTAL IMPACT STATEMENT

Taking the assessment of potential impacts into account, please provide an environmental impact statement that summarises the impact that the proposed activity and its alternatives may have on the environment after the management and mitigation of impacts have been taken into account, with specific reference to types of impact, duration of impacts, likelihood of potential impacts actually occurring and the significance of impacts.

Alternative A (preferred alternative)

Site alternative can be either for the entire development where the activity is proposed on a totally different site, or for certain components of it. In terms of the proposed development, the site alternative will not be further investigated since the applicant is the landowner and has no other land available for residential development in the area, which results in the proposed development occurring on portion of farm Klipfontein 716 and farm Ceres 626 JR or not occurring at all in such instances the no-go alternative will play an important role.

Layout Plan (Preferred Alternative)

Alternative B

Due to land availability and service connections, the proposed site is the only site that has been identified for establishing a township during the consultation process with the Local Municipality. Therefore, no alternative site has been identified or considered during this study.

Alternative C

N/A

No-go alternative (compulsory)

The no-go alternative is the option of not developing the proposed development and its associated infrastructure. The land on the portion of farm Klipfontein 716 and farm Ceres 626 will remain undeveloped. The no development option would result in a lost opportunity in terms of the employment opportunities associated with the construction and operation phase as well as the benefits associated with the provision of houses, schools and other much needed social facilities. A high negative socio-economic impact significance would occur if the proposed development is not constructed.

The “no-go” alternative will however result in the visual environment staying the same with the natural

character of the area contributing to the “sense of place”. If the development proposal is not authorised the vegetation in the current natural parts will remain largely intact which is clearly a positive factor for the biodiversity in the area. The socio-economic benefits of this project however largely outweigh the impacts in an area The No-Go Alternative is therefore not recommended

SECTION E. RECOMMENDATION OF PRACTITIONER

Is the information contained in this report and the documentation attached hereto sufficient to make a decision in respect of the activity applied for (in the view of the environmental assessment practitioner)?	YES	NO

If "NO", indicate the aspects that should be assessed further as part of a Scoping and EIA process before a decision can be made (list the aspects that require further assessment).

N/A

If "YES", please list any recommended conditions, including mitigation measures that should be considered for inclusion in any authorisation that may be granted by the competent authority in respect of the application.

GENERAL ENVIRONMENTAL MANAGEMENT STATEMENT

Roles and Responsibilities

•An EMPr for site establishment, construction and operational phase must be finalized and approved by EDTEA prior to the contractor moving onto site

•The Environmental Control Officer (ECO) must be appointed prior to site development and construction to prevent contravention of the approved EMPr and Environmental Authorization.

•An Environmental Liaison Officer (ELO) must inspect the site during the construction phase on a weekly basis.

•The working areas must be clearly demarcated by the ECO prior to commencement of the construction and no access is to be allowed in sensitive areas.

•The ECO is to conduct monthly audits and prepare monthly audit reports. Copies of these reports are to be provided by the ECO to the developer and EDTEA. The ECO duties extend to the end of the construction phase.

•The proponent will ultimately be responsible for the implementation of the operational EMPr.

DESIGN PHASE

Engineering Design

•Must accommodate spills containment slabs to assist in the containment of accidental spillage during construction phase (concrete and cement batching on site)

•A storm water management plan must be prepared once the engineering design of the site has been finalized.

CONSTRUCTION PHASE

Noise pollution

•Regular maintenance of machinery must be done, as per the manufacturer's instruction

•Working hours should be limited from 07:00 to 17:00 on weekdays, from 07:00 to 13:00 on Saturday and no work must be conducted on Sundays

•Construction employees should be encouraged to not generate noise, which is not essential to construction

•In the event of employment being noisy during lunch breaks It could impact neighboring properties

Air Pollution
•Water should be sprayed on the construction access road during the dry/windy periods
•Construction phase stockpiles which have the potential of generating dust must be covered with tarpaulin/plastic sheeting
•Maintain construction vehicles and machinery to control exhaust emissions.

Water Pollution
•Construction activities must remain within the footprint of the development
•Construction machinery must be maintained by a suitably qualified mechanic, at an appropriately lined site, during working hours, so that diesel and /or oil leaks are avoided
•Prevent run-off by constructing diversion berms and / or placing straw bales on denuded areas.

Erosion Measures
•Should erosion become a problem during the construction phase then diversion berms and drains shall be constructed to divert run-off away from exposed area.
•During this phase, bales can be used as filters across run-off pathways

Accidental Spillage
•Spills shall be cleared up immediately
•The contaminated soils and the spilled material shall be taken to the nearest registered landfill site capable of receiving such spills
•A registered of all incidents shall be kept on site showing measures taken to clear up the spillages

Heritage Issues
•During construction ,if heritage findings are made (graves, archaeological objects,etc), SAHRA should be contacted and works to be stopped immediately

Health and Safety
•Traffic signage shall be erected to advice people of machinery/ construction vehicles, driving in the area.
•Pollution that could be detrimental to humans, flora and fauna shall be prevented as much as possible.
•Construction employees must be restricted to the development area; they must be warned not to trespass on the neighbouring properties
•Point's men must be used at areas where children will be crossing to ensure their safety to school or their homes/households
•Emergency contact numbers must be available on site, and an emergency kit to assist if someone get injured before help arrives
•Fire protection equipment such as, fire extinguisher and hose.

Is an EMPr attached?	YES	NO

The EMPr must be attached as Appendix G.

The details of the EAP who compiled the EIAR and the expertise of the EAP to perform the Basic Assessment process must be included as Appendix H.

If any specialist reports were used during the compilation of this EIAR, please attach the declaration of interest for each specialist in Appendix I.

Any other information relevant to this application and not previously included must be attached in Appendix J.

Kulani Nkuna

_____

NAME OF EAP

_____  _____ __July 2020_____

SIGNATURE OF EAP DATE

SECTION F: APPENDIXES

The following appendixes must be attached:

Appendix A: Maps

Appendix B: Photographs

Appendix C: Facility illustration(s)

Appendix D: Specialist reports (including terms of reference)

Appendix E: Public Participation

Appendix F: Impact Assessment

Appendix G: Environmental Management Programme (EMPr)

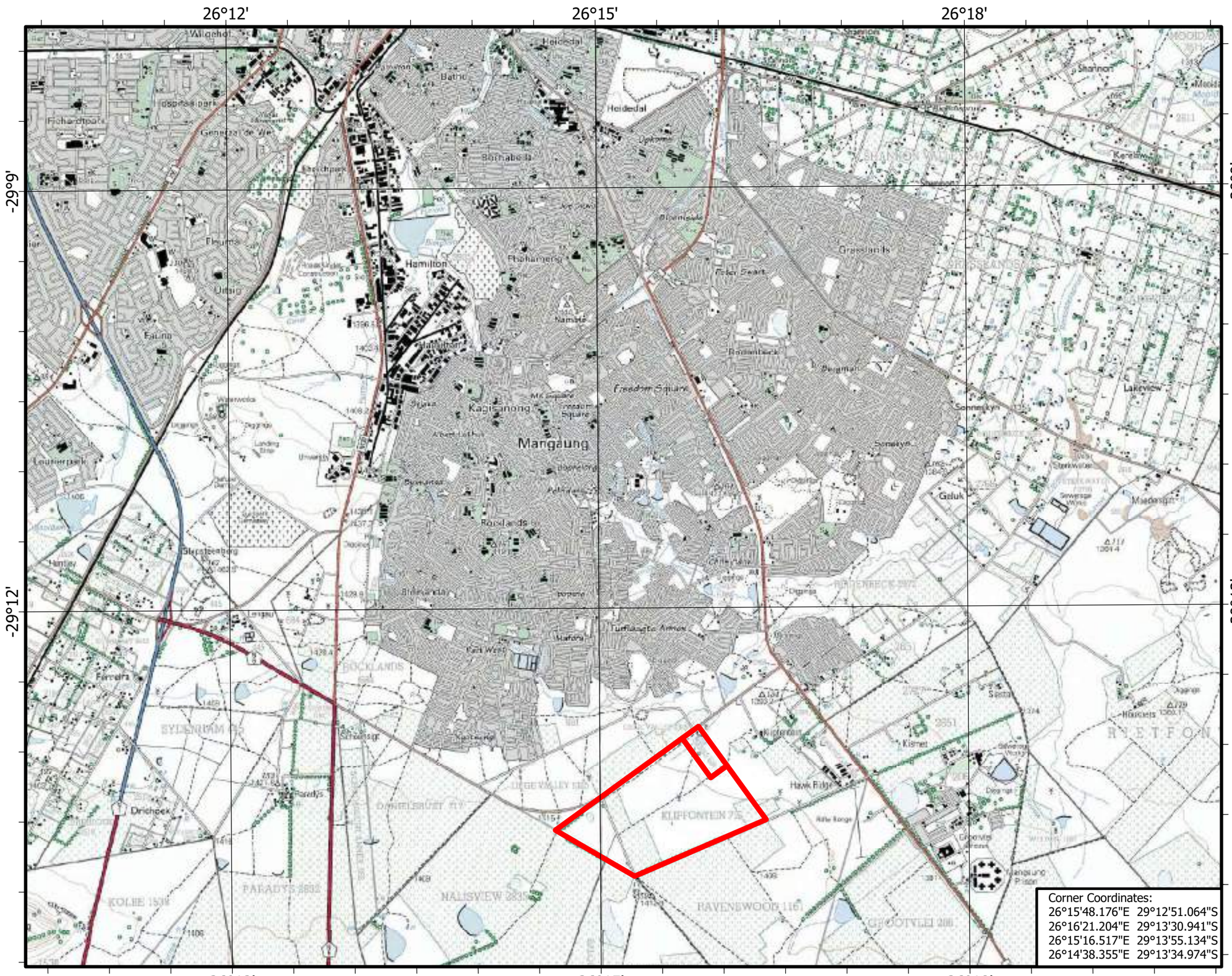
Appendix H: Details of EAP and expertise

Appendix I: Specialist's declaration of interest

Appendix J: Additional Information

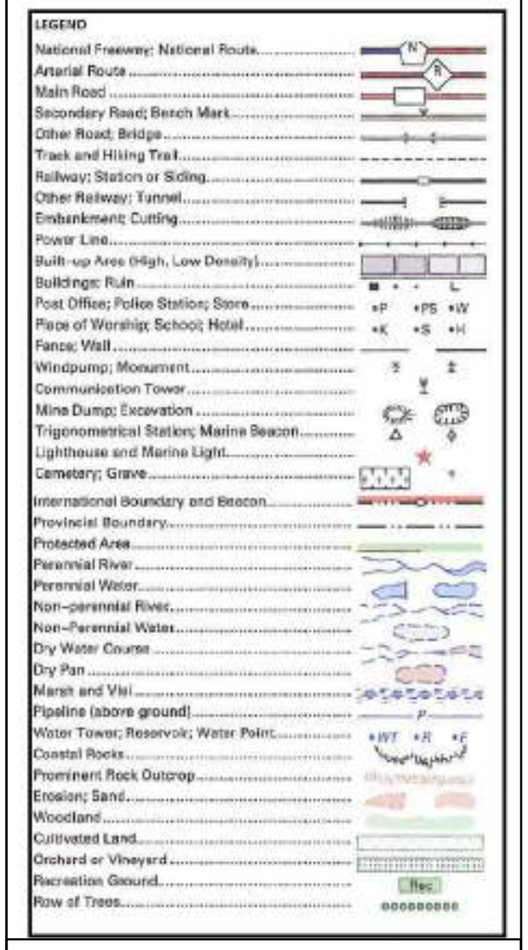
APPENDIX A: MAPS

Locality Map for the Proposed Township a Portion of the Farm Klipfontein 716 and Farm Ceres 626, Mangaung Metropolitan Municipality, Free State Province.



Legend

Proposed Site



Spatial Reference
Name: WGS 1984 UTM Zone 35S
Datum: WGS 1984
Projection: Transverse Mercator

Farm Names: Klipfontein 716 & Ceres 626
SG Code: F0030000000071600000
F0030000000062600000

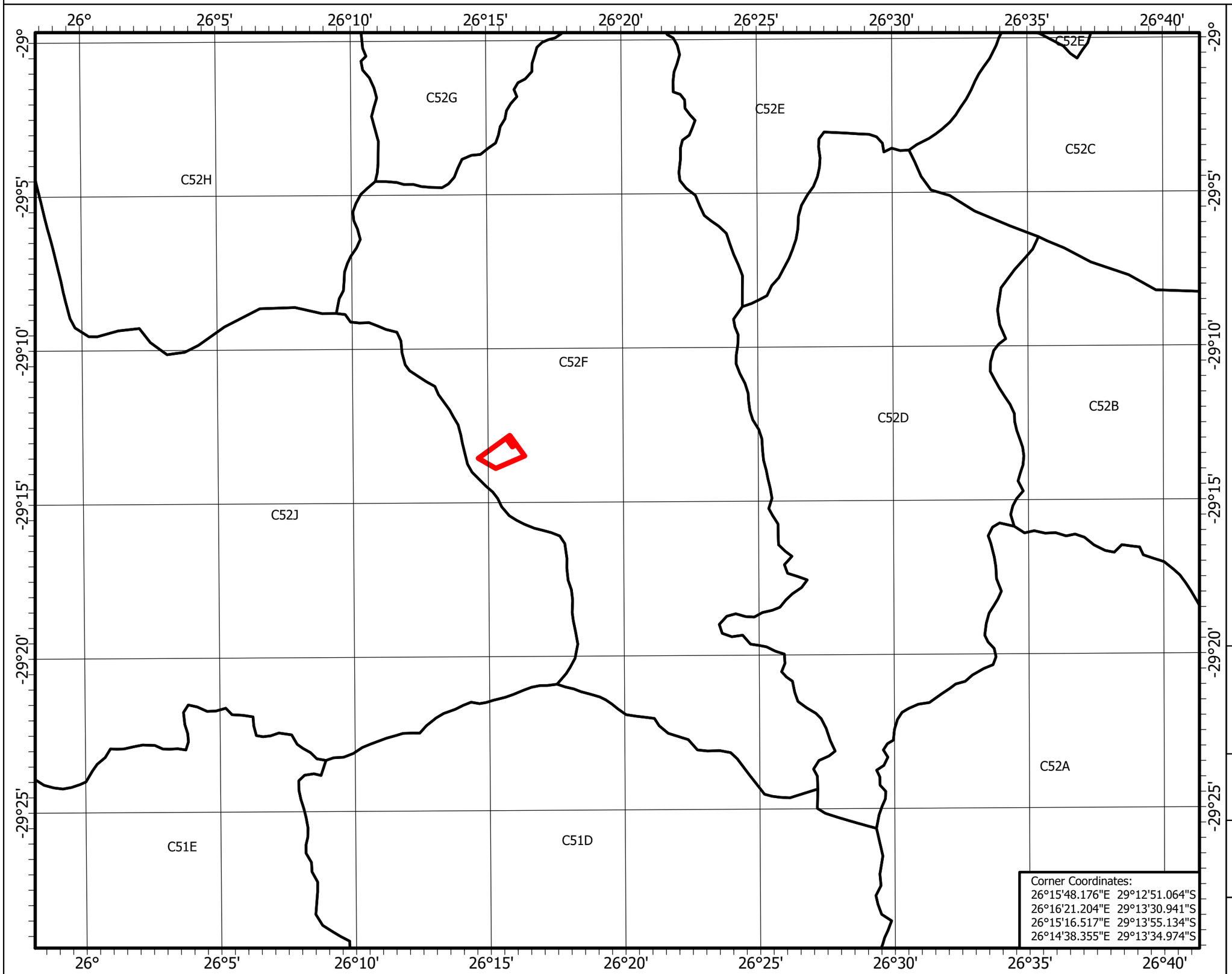
Scale 1:50 000

N
W E
S

INALUK CONSULTING SERVICES

The map was produced by Mielelani Consultancy: info@mielelani.co.za

Catchment Map for the Proposed Township a Portion of the Farm Klipfontein 716 and Farm Ceres 626, Mangaung Metropolitan Municipality, Free State Province.



Legend

- Proposed Site
- SA Catchments

Spatial Reference
Name: WGS 1984 UTM Zone 35S
Datum: WGS 1984
Projection: Transverse Mercator

Farm Names: Klipfontein 716 & Ceres 626
SG Code: F0030000000071600000
F0030000000062600000

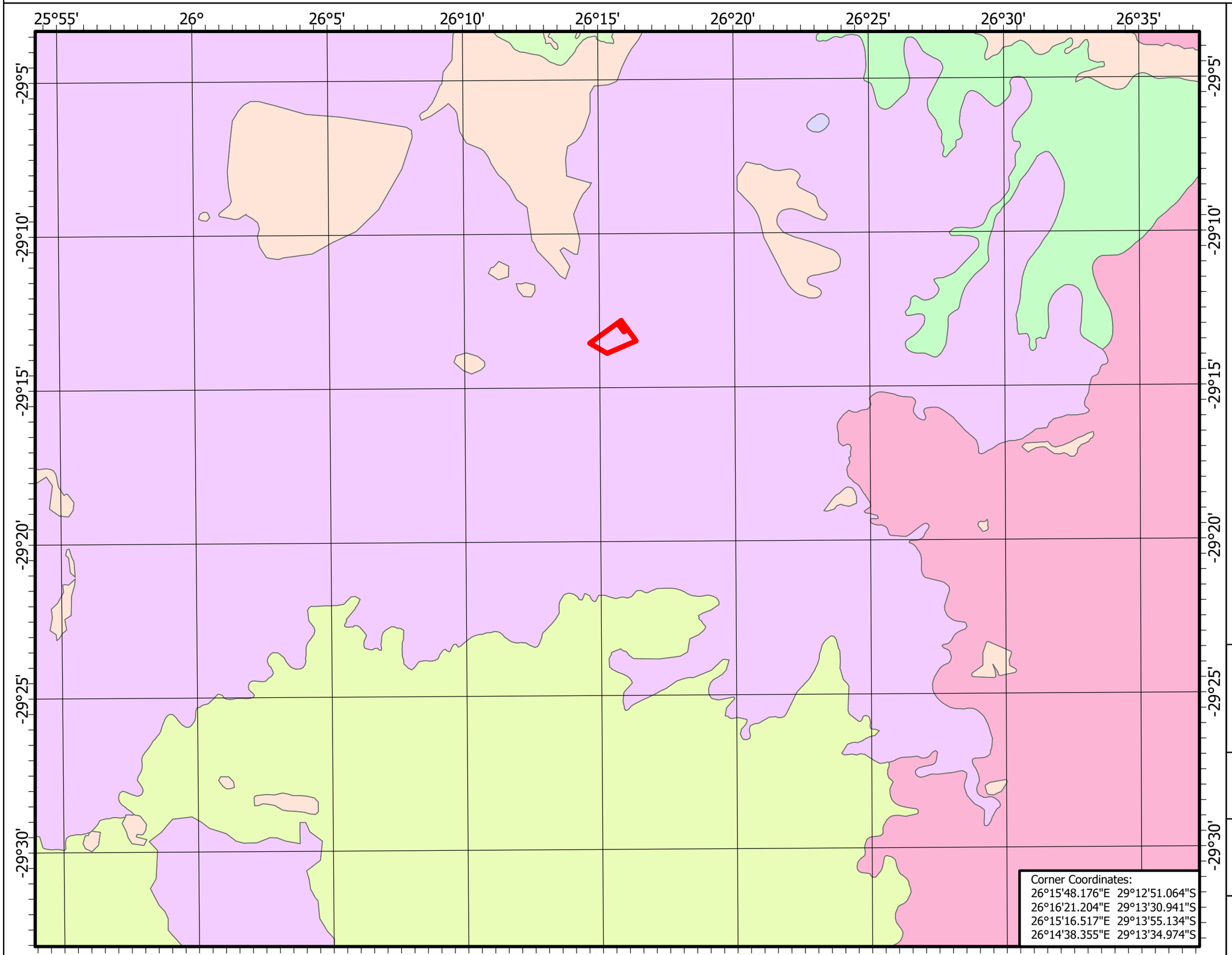
Scale 1:221 602

N W E S

INALUK CONSULTING SERVICES

The map was produced by Mielelani Consultancy: info@mielelani.co.za

Vegetation Map for the Proposed Township a Portion of the Farm Klipfontein 716 and Farm Ceres 626, Mangaung Metropolitan Municipality, Free State Province.



Legend

- Proposed Site

SA Vegetation Type

NAME

- Bloemfontein Dry Grassland
- Bloemfontein Karroid Shrubland
- Central Free State Grassland
- Highveld Alluvial Vegetation
- Highveld Salt Pans
- Winburg Grassy Shrubland
- Xhariep Karroid Grassland

Spatial Reference
Name: WGS 1984 UTM Zone 35S
Datum: WGS 1984
Projection: Transverse Mercator

Farm Names: Klipfontein 716 & Ceres 626
SG Code: F00300000000071600000
F00300000000062600000

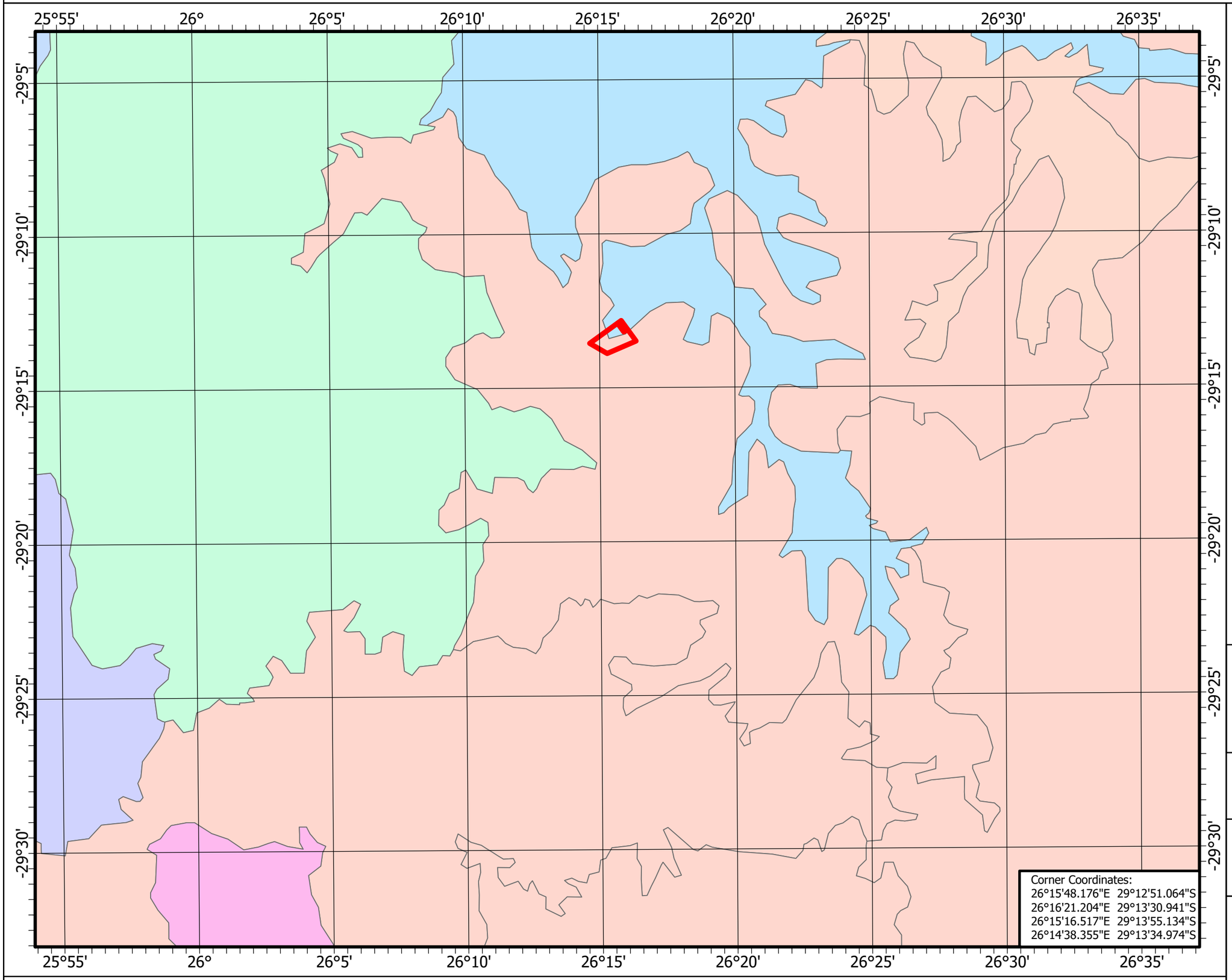
Scale 1:221 602

N W E S

INALUK CONSULTING SERVICES

The map was produced by Mielelani Consultancy: info@mielelani.co.za

Soil Map for the Proposed Township a Portion of the Farm Klipfontein 716 and Farm Ceres 626, Mangaung Metropolitan Municipality, Free State Province.



Legend

- Proposed Site

SA Soils

WRB

- Calcic Luvisols
- Chromic Luvisols
- Ferric Luvisols
- Haplic Luvisols
- Leptic Phaeozems
- Rhodic Cambisols
- Rhodic Lixisols

Spatial Reference
Name: WGS 1984 UTM Zone 35S
Datum: WGS 1984
Projection: Transverse Mercator

Farm Names: Klipfontein 716 & Ceres 626
SG Code: F0030000000071600000
F0030000000062600000

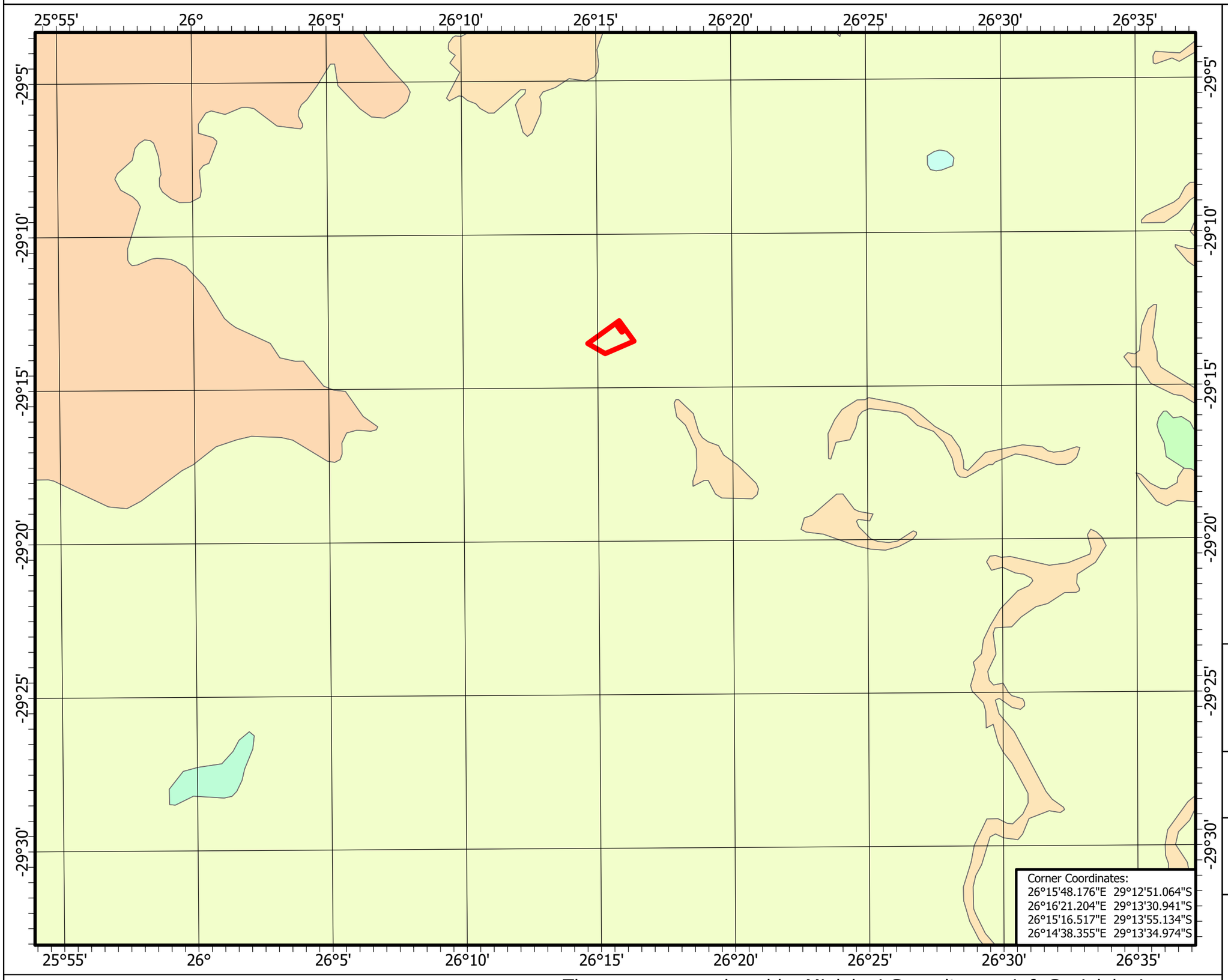
Scale 1:221 602

N W E S

INALUK CONSULTING SERVICES

The map was produced by Mielelani Consultancy: info@mielelani.co.za

Geological Map for the Proposed Township a Portion of the Farm Klipfontein 716 and Farm Ceres 626, Mangaung Metropolitan Municipality, Free State Province.



Legend

- Proposed Site

RSA Geology

STRAT_NAME

- *
- BEAUFORT
- KAROO DOLERITE
- TIERBERG
- VOLKSRUST

Spatial Reference
Name: WGS 1984 UTM Zone 35S
Datum: WGS 1984
Projection: Transverse Mercator

Farm Names: Klipfontein 716 & Ceres 626
SG Code: F00300000000071600000
F00300000000062600000

Scale 1:221 602

N W E S

INALUK CONSULTING SERVICES

The map was produced by Mielelani Consultancy: info@mielelani.co.za

APPENDIX B: PHOTOGRAPHS

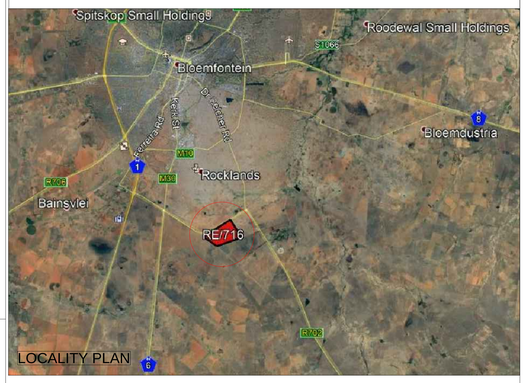
SITE PICTURES

APPENDIX C: FACILITY ILLUSTRATION(S)

PROPOSED TOWNSHIP:

situated on:

A PORTION OF THE FARM KLIPFONTEIN 716 AND FARM CERES 626, BLOEMFONTEIN



LAND USE

ZONING	LAND USE		No. OF STANDS	AREA Ha	% OF AREA
RESIDENTIAL 1	RESIDENTIAL		3973	131.2	56
RESIDENTIAL 2	SOCIAL HOUSING		2	4.4	1.2
BUSINESS 1	BUSINESS		2	3.3	1.4
INSTITUTIONAL	COMMUNITY FACILITY		2	0.3	0.1
	HEALTH CENTRE		1	1.2	0.5
	LIBRARY		1	0.8	0.3
	POLICE STATION		1	1.2	0.5
RECREATIONAL	SPORTS FIELD		1	1.9	0.8
EDUCATIONAL	PRIMARY SCHOOL		2	4.2	1.8
	COMBINED SCHOOL		1	7.4	3.2
	CRECHE		3	0.4	0.2
PLACE OF WORSHIP	CHURCH		3	0.5	0.2
MUNICIPAL	MUNICIPAL		1	0.2	0.1
PUBLIC OPEN SPACE	PUBLIC OPEN SPACE		8	12.6	5.4
STREETS	*		*	53.8	28.3
TOTAL			4001	232.4	100

GENERAL NOTES

1) Cadastral Boundaries _ _ _ _ _ _ _
2) Geodetic System WGS 84
3) All internal roads are 16m & 12m wide unless indicated otherwie
4) All Dimensions and areas are approximate & subject to final Survey by Proffesional Land Surveyors
5) Building Line are subject to applicable Scheme
6) Zoning are subject to appicable Zoning Scheme
7) Contour Note: The contour survey is in accordance with the standard laid down by the regulations relating to Township Establishment and Land Use

CLIENT : MANGAUNG METRO MUNICIPALITY

Designed: S.DLAMINI

Checked: F.MATHEBULA

PLAN NO:	DATE:	SCALE:
KLIP/02/2020	MARCH-2020	1:3000

Broadwalk Office Park
6 Eros Road
Faerie Glen
Pretoria, 0004
Tel: +27 12 770 4022
Cell: 072 573 2390
Email: info@ngoti.co.za

NGOTI DEVELOPMENT CONSULTANTS

TOWN PLANNER
FIRM:
DATE:

ENGINEER
FIRM:
DATE:

LAND SURVEYOR
FIRM:
DATE:

FLOODLINE NOTE

IT IS HEREBY CERTIFIED IN TERMS OF ARTICLE 144 OF THE NATIONAL WATER ACT (ACT No. 36 OF 1998 THAT THE TOWNSHIP SHOWN ON THIS PLAN IS NOT AFFECTED BY FLOODLINES REPRESENTING THE MAXIMUM LEVEL LIKELY TO BE REACHED BY FLOODWATERS IN A DEFINED WATER COURSE ON AVERAGE ONCE IN EVERY 50 /100 YEARS.

EXISTING ROAD
ARTERIAL ROAD
COLLECTOR ROAD
DISTRIBUTION ROAD
UNDERPASS
UNDERPASS
UNDERPASS

APPENDIX D: SPECIALIST REPORTS (INCLUDING TERMS OF REFERENCE)

APPENDIX D1: ECOLOGICAL REPORT

ECOLOGICAL IMPACT ASSESSMENT

PROPOSED TOWNSHIP SITUATED ON A PORTION OF THE FARM KLIPFONTEIN 716 AND FARM CERES 626, BLOEMFONTEIN, MANGAUNG METROPOLITAN MUNICIPALITY, FREE STATE PROVINCE

September 2019

Prepared for:

Prepared by:

Marius Venter

marius@enviroworks.co.za

TABLE OF CONTENTS

LIST OF FIGURES

CONTENT CROSS-REFERENCE CHECKLIST

Table 1 As stated per Government Notice (GN) Regulation 326 of 7 April 2017, Appendix 6, a Specialist Report should contain the information listed in the table, with corresponding section names.

Requirement	Section

(a) details of— (i) the specialist who prepared the report; and (ii) the expertise of that specialist to compile a specialist report including a curriculum vitae	Details of the Specialist
(b) a declaration that the specialist is independent in a form as may be specified by the competent authority	Declaration of Independence
(c) an indication of the scope of, and the purpose for which, the report was prepared	Objective
(cA) an indication of the quality and age of base data used for the specialist report	Methodology; Date and Season of Site Visit
(cB) a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change	Risk Ratings of Potential Impacts
(d) the duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment	Date and Season of Site Visit
(e) a description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used	Methodology
(f) details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure, inclusive of a site plan identifying site alternatives	Sensitivity map (Study Area)
(g) an identification of any areas to be avoided, including buffers	Description of Potential Ecological Impacts and their Recommended Mitigation Measures
(h) a map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers	Sensitivity map (Study Area)
(i) a description of any assumptions made and any uncertainties or gaps in knowledge	Assumptions, Uncertainties and Gaps in Knowledge
(j) a description of the findings and potential implications of such findings on the impact of the proposed activity or activities	Description of Potential Ecological Impacts and their Recommended Mitigation Measures

(k) any mitigation measures for inclusion in the EMPr	Description of Potential Ecological Impacts and their Recommended Mitigation Measures
(l) any conditions for inclusion in the environmental authorisation	Recommendation and Conclusion
(m) any monitoring requirements for inclusion in the EMPr or environmental authorisation	Monitoring, Recommendation and Conclusion
(n) a reasoned opinion— (i) whether the proposed activity, activities or portions thereof should be authorised (iA) regarding the acceptability of the proposed activity or activities; and (ii) if the opinion is that the proposed activity, activities or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan	Recommendation and Conclusion
(o) a description of any consultation process that was undertaken during the course of preparing the specialist report	Methodology
(p) a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	N/A
(q) any other information requested by the competent authority	None up to date

i DETAILS OF THE SPECIALIST

Name:	Marius
Surname:	Venter
Highest qualification:	BSc Conservation Ecology and Entomology (SU)
IAIA registered:	No. 10458590

SACNASP Candidate Scientist:	No. 117708
Postal address:	Enviroworks Suite 116 Private Bag X01 Brandhof 9324
Physical address:	103 Donald Murray Avenue Park West Bloemfontein 9301
Cell phone:	072 286 6683
E-mail:	marius@enviroworks.co.za

Relevant Qualifications

- BSc Conservation Ecology and Entomology (SU)
- Currently completing MSc in Environmental Management at the University of the Free State (2017-present)
- LLB University of the Free State (2nd year student)

Registrations and Affiliations

- SACNASP: 117708
- IAIA International Registration: 10458590
- IAIAsa Registration: 6293
- South African Green Industries Council (SAGIC)

Short Courses

2018: Intermediate GIS

2017: Wetland Management: Introduction and Delineation – WLID1502S

Introduction to GIS and GPS – GISA1500S

2016: SAGIC Invasive Species Training. Module 1: Introduction and Legislation and Module 2: Deveoping and Implementing Control Plans – SAWC 2582 & 2741

Work experience

- January 2017 - June 2018: Research assistant, University of the Free State (UFS)
- July 2018 - present: Environmental Consultant and legal assistant at Enviroworks

Key project experience

- Experience in 1) Compilation of documentation and report writing 2) Legal compliance and notices 3) Conducting ecological studies and reviews 4) Environmental Audits 5) Environmental Authorisations.

Basic Assessment Applications

- Karan Beef-Proposed extension and construction of a new feedlot–Aliwal North, Free State Province.

Section 24G Application for Rectification:

- Section 24G Application for Authorisation, Supreme Chicken, Portion 1285, Farm Belgie.

Ecological Impact Assessment Specialist Report Experience

- Ecological Impact Assessment: Patrick Mofokeng: The proposed development of an oil recycling plant, near Lakeview, Mangaung, Free State;
- Ecological impact assessment: Supreme Poultry, Bloemfontein, Free State;
- Review Ecological Studies: 8 Ecological Studies reviewed for establishment of borrow pits for road construction by SANRAL;
- Ecological Impact Assessment: Karan Beef-Proposed extension and construction of a new feedlot–Aliwal North, Free State Province;
- Ecological Impact Assessment: Proposed construction of an iron/steel smelter at the Botshabelo industrial area on erf 173 and erf 188 within the Mangaung Metropolitan Municipality, Free State Province; and,
- Ecological Impact Assessment: Proposed Township situated on a Portion of the farm Klipfontein 716 and farm Ceres 626, Bloemfontein, Mangaung Metropolitan Municipality, Free State Province.

Environmental Authorisation amendment

- Establishment of Vista Park ext 3 township, Bloemfontein, Free State Province.

Wetland Delineation

- Wetland delineation and risk assessment for water use license application for the proposed Zachtevlei dam and bulk conveyance infrastructure, Lady Grey, Eastern Cape.

Legal Queries and Due Diligence reports

- The construction of a 9 km steel pipeline for irrigation at Witbank, Namakwa District Municipality, Northern Cape;
- Proposed development of a waste water treatment works and associated pipeline on the remaining extent of erf no 424, Britsown, Northern Cape Province;
- Request for conformation that the existing carpe diem farm operations is lawful / or not and if a section 24g rectification application will be required, Northern Cape Province;
- Environmental subservices for the improvement of National Route 7 Section 2 between Rooidraai (km 7.49) and Moorreesburg (km 33.90);
- Environmental subservices for the improvement of National Route 7 Section 3 between Piketberg (km 31.53) and Piekenierskloof Pass (km 65.3);
- The construction of a pipeline to pump water from a river into two dams at the Krugers Post Farm

- Proposed development of a security village and associated infrastructure on Erf 3952 & 3975, Hartswater, Northern Cape Province;
- 8 (eight) Development Option/Due Diligence Reports for Phunga Consulting Engineers in the Northern Cape Province;
- Applicability of the NEMA EIA Regulations, 2014 (as amended) for the proposed development of a twenty five meter (25 m) lattice mast on Erf 994, Danielskuil, Northern Cape Province.
- Applicability of the NEMA EIA Regulations, 2014 (as amended) for the proposed development of an outdoor advertising billboard in Bloemfontein, Free State Province.

ECO - Environmental audits

- Mission Point Mine – Free State province;
- The construction of a 132kv powerline between Tweespruit and Driedorp, Free State Province;
- Road Construction – Molpro;
- External Water Use Licence audit – Letsatsi PV solar power plant;
- REH External Environmental Authorisation compliance audit - Stortemelk and Bethelehem Hydro power plants, Free State Province;
- Monthly ECO audit: Establishment of Vista Park Ext 3 township, Bloemfontein, Free State Province; and,
- LaFarge Olive Hill: Environmental Management programme review and update, Free State Province.

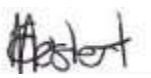
- **DECLARATION OF INDEPENDENCE**

I, Marius Venter, ID 9401115136088, declare that I:

- am an Environmental Consultant at Enviroworks;
- act as an independent specialist consultant in the field of Botany and Ecology;
- am assigned as specialist consultant by Enviroworks (Pty) Ltd for this proposed project;
- I do not have or will not have any financial interest in the undertaking of the activity other than remuneration for work as stipulated in the terms of reference;
- remuneration for services by the proponent in relation to this proposal is not linked to approval by decision-making authorities responsible for permitting this proposal;
- the consultancy has no interest in secondary or downstream developments as a result of the authorisation of this project;
- have no and will not engage in conflicting interests in the undertaking of the activity;
- undertake to disclose to the client and the competent authority any material, information that have or may have the potential to influence the decision of the competent authority required in terms of the Environmental Impact Assessment Regulations 2017; and,
- will provide the client and competent authority with access to all information at my disposal, regarding this project, whether favourable or not.

Marius Venter

Signature

Report compiled by	Marius Venter Bsc Conservation Ecology and Entomology	
Report reviewed by	Elana Mostert MSc Botany (SU)	
Report signed off by	Elbi Bredenkamp MSc Botany (UFS) SACNASP – 400238/11	

ii DETAILS OF THE SPECIALIST FOR REVIEW

Name:	Elana
Surname:	Mostert
Highest qualification:	MSc Botany (SU)
IAIAsa registered:	No. 5631
Botanical Society of South Africa:	No. 79489
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RELEVANT QUALIFICATIONS

- MSc Botany (SU): Specialising in Invasion Biology & Fynbos Restoration
- BSc Hons Plant Sciences- Ecology (UP)
- BSc Environmental Sciences (UP)
- Section 21 (c) and (i) Training: Roodeplaat (November 2017)
- SASS5 Aquatic Biomonitoring Training (November 2018)

WORK EXPERIENCE

- March 2016 - May 2017: Field assistant, Plant Ecologist at Department of Environmental Affairs (Oceans & Coasts)
- June 2017 - current: Environmental Consultant & Ecological Specialist at Enviroworks
- January 2019 – current: Office manager for Enviroworks, Cape Town

Published popular Science article:

- Mostert, E., Gaertner, M., Hall, S., Mukundamago, M., Holmes, P. 2015. *Solving the puzzle of restoring the missing fynbos*. Quest, Volume 11, Number 3.

Publication accepted for journal publication:

- Mostert, E., *et al*., Impacts of invasive alien trees on threatened lowland vegetation types in the Cape Floristic Region, South Africa, South African Journal of Botany 108 (2017) 209–222.
- Mostert E., et al, A multi-criterion approach for prioritizing areas in urban ecosystems for active restoration following invasive plant control, Environmental Management, (In production), 1-20, **DOI** 10.1007/s00267-018-1103-9

FRESHWATER ECOLOGICAL ASSESSMENTS

- Wetland delineation and DWS Section 21 (c) & (i) Water Use Risk Matrix for the proposed development of 100 erven on Erf 210 in Sutherland, Karoo Hoogland Local Municipality, Northern Cape, COGHSTA.
- Wetland delineation and DWS Section 21 (c) & (i) Water Use Risk Matrix for the proposed Zachtevlei Dam And Bulk Conveyance Infrastructure, Lady Grey, Eastern Cape, Indwe Environmental Consulting for Joe Gqabi District Municipality.
- DWS Section 21 (c) & (i) Water Use Risk Matrix for the proposed development of Erf 3976 for a mixed use development in Hartswater, Phokwane Municipality, Northern Cape, Makespace Architects.
- DWS Section 21 (c) & (i) Water Use Risk matrix for the proposed construction of a cellular telecommunications base station and associated infrastructure in Roodekrans, Gauteng, Coast to Coast Towers (Pty) Ltd.
- Wetland delineation for the proposed development of the Sarah Baartman Agricultural Hub, Eastern Cape, FemPlan.
- Wetland delineation for the proposed development of the Alfred Nzo Agricultural Hub, Eastern Cape, FemPlan.
- Wetland delineation for the proposed development of the OR Tambo Agricultural Hub, Eastern Cape, FemPlan.
- DWS Section 21 (c) & (i) Water Use Risk Matrix for the proposed expansion of a granite mine in Biesjesfontein, Springbok, Northern Cape, Greenmined.
- DWS Section 21 (c) & (i) Water Use Risk Matrix for the proposed development of new sports grounds at Waterstone College, Olifantsvlei, Gauteng, CURRO.
- Wetland delineation and DWS Section 21 (c) & (i) Water Use Risk Matrix for the 24G Application for the unlawful clearing of indigenous vegetation and construction of chicken lay houses, Molote City, North West Province, Baramakama Poultry (Pty) Ltd.
- Freshwater specialist study for the extension of a canal by 10 metres at km0.1 along Minor Road 6924, Western Cape Province, Garden Route District Municipality.
- Wetland delineation and DWS Section 21 (c) & (i) Water Use Risk Matrix for the 24G Application for the unlawful construction of a poultry farm, Belgie, Thaba 'Nchu, Free State, Country Bird Holdings.
- Freshwater Study and DWS Section 21 (c) & (i) Water Use Risk Matrix for the the periodic maintenance of TR1/2, TR1/3, TR44/1, TR88/1, MR401, MR402 and DR1834, near Uniondale, Western Cape Province, Western Cape Department of Transport and Public Works.
- DWS Section 21 (c) & (i) Water Use Risk Matrix for the rehabilitation of Divisional Road 1688 from Calitzdorp (KM 1.00) to the Calitzdorp Spa Turnoff (KM 15.64), Western Cape Province, BVi Consulting Engineers.

WATER USE LICENCE APPLICATIONS

- General Authorization for the rehabilitation of Divisional Road 1688 from Calitzdorp (KM 1.00) to the Calitzdorp Spa Turnoff (KM 15.64), Western Cape Province, BVi Consulting Engineers.

- General Authorization for the the periodic maintenance of TR1/2, TR1/3, TR44/1, TR88/1, MR401, MR402 and DR1834, near Uniondale, Western Cape Province, Western Cape Department of Transport and Public Works.
- Water Use Licence Application for chicken lay houses, Molote City, North West Province, Baramakama Poultry (Pty) Ltd.

SECTION 24G RECTIFICATION APPLICATION

- Section 24G Application for the unlawful clearing of indigenous vegetation and construction of chicken lay houses, Molote City, North West Province, Baramakama Poultry (Pty) Ltd.

ENVIRONMENTAL CONTROL OFFICER

- Environmental Control Officer for the rehabilitation of Divisional Road 1688 from Calitzdorp (KM 1.00) to the Calitzdorp Spa Turnoff (KM 15.64), Western Cape Province, BVi Consulting Engineers.

ENVIRONMENTAL REHABILITATION PLAN

- Environmental rehabilitation plan for all the areas affected by the continuous spillage of raw sewage in and around Upington, Northern Cape Province, Dawid Kruiper Local Municipality.

BASIC ASSESSMENT EXPERIENCE

- The proposed construction of a cellular telecommunications base station and associated infrastructure on Portion 76 of Farm No. 106, Robertson, Western Cape Province, Coast to Coast Towers (Pty) Ltd.
- The proposed construction of a cellular telecommunications base station and associated infrastructure on Portion 1 of Farm No. 178, Fisantekraal, City of Cape Town, Western Cape Province, Coast to Coast Towers (Pty) Ltd.
- The proposed development of a telecommunication base station and associated infrastructure on Portion 8 of the Farm Delta no. 1003, Groot Drakenstein, Western Cape Province, Coast to Coast Towers (Pty) Ltd.
- Proposed development of a free standing cellular communication base station and associated infrastructure on Portion 7 of the Farm Haane Kuil no. 335, Beaufort West, Western Cape Province, Warren Petterson Planning (Pty) Ltd.

INTEGRATED ENVIRONMENTAL AUTHORISATIONS

- Amendment of the Environmental Integrated Authorisation for the Continuous Ash Disposal at Matimba Power Station, Lephalale, Limpopo Province, Eskom Holdings SOC Ltd.

ENVIRONMENTAL MANAGEMENT PLANS

- The proposed construction of a cellular telecommunications base station and associated infrastructure on Portion 76 of Farm No. 106, Robertson, Western Cape Province, Coast to Coast Towers (Pty) Ltd.
- The proposed construction of a cellular telecommunications base station and associated infrastructure on Portion 1 of Farm No. 178, Fisantekraal, City of Cape Town, Western Cape Province, Coast to Coast Towers (Pty) Ltd.
- The proposed development of a telecommunication base station and associated infrastructure on Portion 8 of the Farm Delta no. 1003, Groot Drakenstein, Western Cape Province, Coast to Coast Towers (Pty) Ltd.

- Proposed development of a free standing cellular communication base station and associated infrastructure on Portion 7 of the Farm Haane Kuil no. 335, Beaufort West, Western Cape Province, Warren Petterson Planning (Pty) Ltd.

EXPERIENCE IN PERMITS AND LICENCING

- Flora removal permit and translocation guidelines for the periodic maintenance of National Route 2 Section 4 between Riviersonderend (km 0.0) and Swellendam (km 56.9), Western Cape Province, SANRAL.
- Flora removal permit for the re-surfacing of the Donkergat Access Road located within the Langebaan 4 Special Forces Regiment Base, Langebaan, Western Cape, Department of Public Works**.**
- Fauna and flora removal permits for the upgrading of intersections and resealing of road sections between Hotazel and Black Rock, Northern Cape, SMEC.
- Flora removal permit for the rehabilitation of Divisional Road 1688 from Calitzdorp (KM 1.00) to the Calitzdorp Spa Turnoff (KM 15.64), Western Cape Province, BVi Consulting Engineers.

ECOLOGICAL IMPACT ASSESSMENT EXPERIENCE

- Ecological Impact Assessment for the proposed development of 100 erven on Erf 210 in Sutherland, Karoo Hoogland Local Municipality, Northern Cape, COGHSTA Northern Cape.
- Ecological Impact Assessment for the periodic maintenance of National Route 2 Section 4 between Riviersonderend (km 0.0) and Swellendam (km 56.9), Western Cape Province, SANRAL.
- Flora identification study for the re-surfacing of the Donkergat Access Road located within the Langebaan 4 Special Forces Regiment Base, Langebaan, Western Cape, Department of Public Works.
- Quarterly monitoring assessment for the rehabilitation efforts on Portion 5 of Farm 830 Doornekraal, Malmesbury, Western Cape.
- Botanical inspection and recommendations for vegetation rehabilitation at 13 Duikerweg, Melkbosstrand, Western Cape.
- Botanical inspection along R60 selected road crossing and road widening between Worcester and Ashton, Western Cape, BVi Consulting Engineers.
- Ecological Impact Assessment for the proposed development of the Mapungubwe Visitor Interpretation Centres and Overnight Facilities, Limpopo Province, SANParks.
- Ecological Impact Assessment for the proposed development of Erf 3976 for a mixed use development in Hartswater, Phokwane Municipality, Northern Cape, Makespace Architects.
- Ecological Impact Assessment for the proposed construction of a cellular telecommunications base station and associated infrastructure in Roodekrans, Gauteng, Coast to Coast Towers (Pty) Ltd.
- Ecological Impact Assessment for the proposed construction of six lay houses and two new production (hen) houses at Frans Dam Farm, No. 803 Portion 3 in Brandfort, Free State, Moreson Pluimvee Boerdery (Pty) Ltd.
- Ecological Impact Assessment for the 24G Application for the unlawful clearing of indigenous vegetation and construction of chicken lay houses, Molote City, North West Province, Baramakama Poultry (Pty) Ltd.
- Ecological Impact Assessment for the proposed construction of a composting facility on Farm No. 1136 Terugval Portion 1 in Brandfort, Free State, Moreson Pluimvee Boerdery (Pty) Ltd.
- Ecological Impact Assessment for the 24G Application for the unlawful construction of a poultry farm, Belgie, Thaba 'Nchu, Free State, Country Bird Holdings.

- Ecological Impact Assessment for the the periodic maintenance of TR1/2, TR1/3, TR44/1, TR88/1, MR401, MR402 and DR1834, near Uniondale, Western Cape Province, Western Cape Department of Transport and Public Works.
- Botanical Survey for the proposed 20m monopole mast and base station on Erf 455, Simon's Town, Western Cape Province, Atlas Tower (Pty) Ltd.

ALIEN INVASIVE SPECIES MANAGEMENT EXPERIENCE

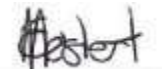
- Preparation of a plan to control and eradicate invasive species as contemplated in Section 76 of the Act, National Environmental Management: Biodiversity Act, 2004 (Act No.10 Of 2004) (NEMBA) for Theewaterskloof Local Municipality**.**
- Baseline Biodiversity Database and Alien Management Strategy Recommendations, Drakenstein, Western Cape, Drakenstein Municipality.
- Review and presentation of Lafarge Saldanha Alien Invasive Species Management Plan, Saldanha, Western Cape Province, Lafarge South Africa.
- Alien Invasive Species Training for staff and management, Saldanha, Western Cape Province, Lafarge South Africa.

iii DECLARATION OF INDEPENDENCE

I, Elana Mostert, ID 910523 0099 085, declare that I:

- am an Environmental Consultant at Enviroworks;
- act as an independent specialist consultant in the field of Botany and Ecology;
- am assigned as specialist consultant by Enviroworks (Pty) Ltd. for this proposed project;
- I do not have or will not have any financial interest in the undertaking of the activity other than remuneration for work as stipulated in the terms of reference;
- remuneration for services by the proponent in relation to this proposal is not linked to approval by decision-making authorities responsible for permitting this proposal;
- the consultancy has no interest in secondary or downstream developments as a result of the authorisation of this project;
- have no and will not engage in conflicting interests in the undertaking of the activity;
- undertake to disclose to the client and the competent authority any material, information that have or may have the potential to influence the decision of the competent authority required in terms of the Environmental Impact Assessment Regulations 2017; and,
- will provide the client and competent authority with access to all information at my disposal, regarding this project, whether favourable or not.

Elana Mostert



Signature

1. Indemnity and Conditions Relating to this Report

The findings, results, observations, conclusions and recommendations given in this report are based on the author's best scientific and professional knowledge as well as available information. The report is based on survey and assessment techniques which are limited by time and budgetary constraints relevant to the type and level of investigation undertaken and Enviroworks and its staff reserve the right to modify aspects of the report including the recommendations if and when new information becomes available from ongoing research or further work in this field, or pertaining to this investigation.

Although Enviroworks exercises due care and diligence in rendering services and preparing documents, Enviroworks accepts no liability, and the client, by receiving this document, indemnifies Enviroworks and its directors, managers, agents and employees against all actions, claims, demands, losses, liabilities, costs, damages and expenses arising from or in connection with services rendered, directly or indirectly by Enviroworks and by the use of the information contained in this document.

This report must not be altered or added to without the prior written consent of the author. This also refers to electronic copies of this report which are supplied for the purposes of inclusion as part of other reports, including main reports. Similarly, any recommendations, statements or conclusions drawn from or based on this report must make reference to this report. If these form part of a main report relating to this investigation or report, this report must be included in its entirety as an appendix or separate section to the main report.

2. Introduction

Enviroworks (Pty) Ltd has been appointed by Inaluk Consulting Services to conduct an Ecological Impact Assessment for the proposed construction of a township situated on a Portion of the Farm Klipfontein 716 and Farm Ceres 626, Bloemfontein, Mangaung Metropolitan Municipality, Free State Province (Figure 1). The proposed project area has a development footprint of approximately 193 ha.

This project will entail the clearing of vegetation and construction of the proposed Township. The proposed township area is situated across an existing township. In Figure 1 the preliminary layout of the proposed township can be seen. As per client information a proposed township together with all the construction activities related thereto is proposed.

The proposed township development will entail construction of numerous infrastructure, listed in Table 1 below. Planned infrastructure on site are listed according to their respective functional categories:

Table 1 - Proposed development structures.

Zoning	Land Use	No. of stands	Area (Ha)	% of area
Residential 1	Residential stands	4000	125	65
Business 1	Business	2	2.4	1.2
Institutional	Social Facility	2	1.3	0.67
	Community facility	2	0.4	0.2
	Health centre	1	0.8	0.4
Educational	Primary School	3	9.5	4.9
	Secondary School	1	4.8	2.4
	Creche	2	0.42	0.2
Place of worship	Church	2	0.39	0.2
Municipal	Municipal	1	0.23	1.1
Public Open space	Public Open space	3	4.47	2.3
Streets	Streets	-	40.79	21.43
Total	-	4019	192.9	100

Infrastructure and activities usually associated with a township includes, but is not limited to the following:

- Bulk infrastructure services;
- Water pipelines (Storm water and sewer);
- Telecommunication;
- Electrical; and,
- Housing and facility construction.

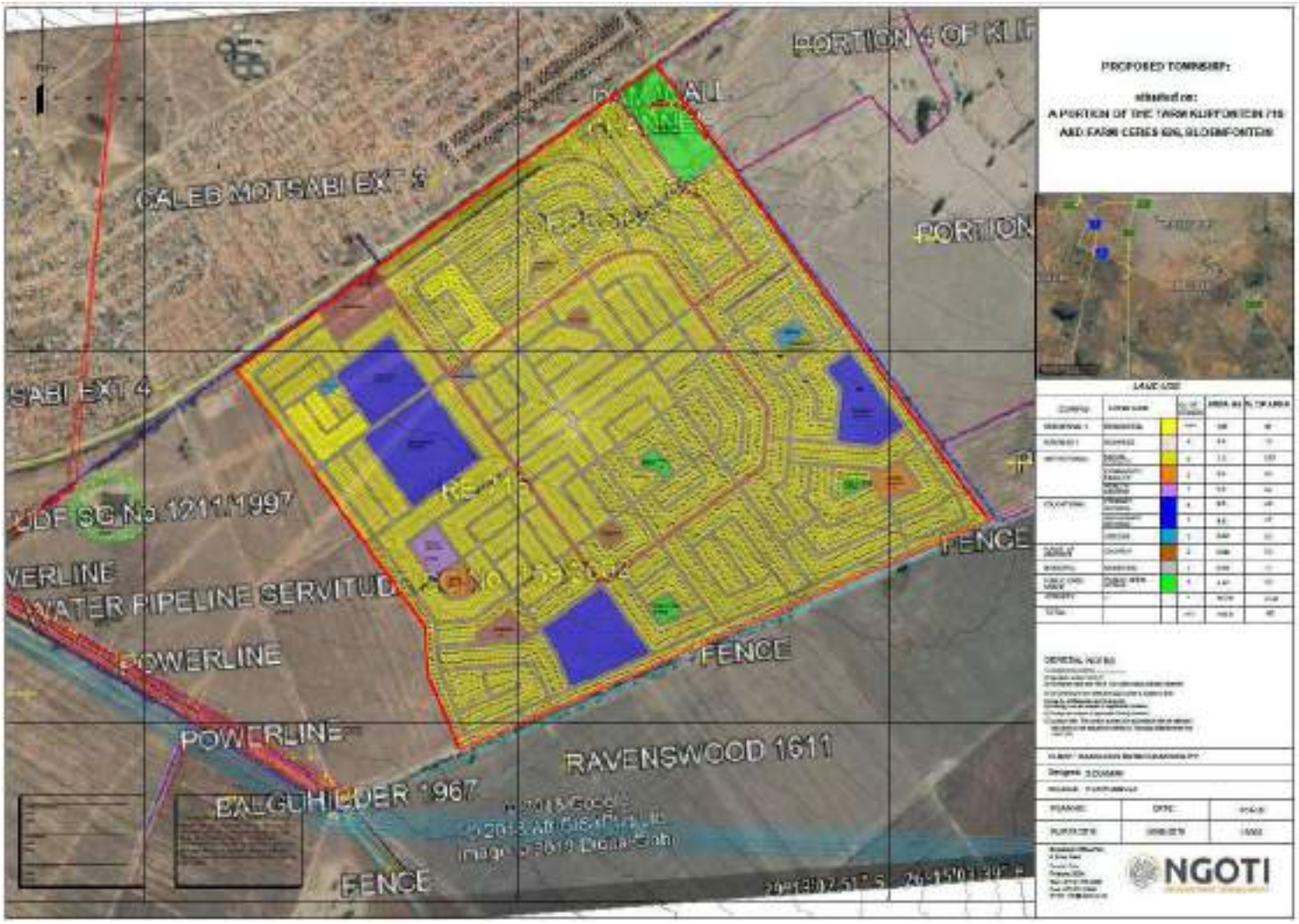


Figure 1 - Proposed layout of the township development. Map provided by Inaluk Consulting Services

2.1. Approach overview

An Ecological Impact Assessment was conducted for the site proposed for the township development as well as the activities related to such construction, operation and decommissioning phases in order to determine and evaluate the nature, significance and extent of the potential impacts that the proposed project will have on the natural environment. This was required in order to determine the potential presence of ecologically significant species or habitats within the proposed project footprint. Proposed mitigation and management measures are also recommended in order to attempt to reduce/alleviate these identified potential impacts. A site visit/assessment was therefore conducted on the proposed construction footprint on 23 July 2019 in order to fulfil this requirement. Preliminary preparations conducted prior to the site visit/assessment were as follows:

- Geo-referenced spatial information was obtained of the outer perimeter of the proposed project site in order to determine the direct impact footprint; and,
- A desktop study was conducted to review the information available on the vegetation types as well as ecological sensitivity of the area in order to determine the ecological significance of the area as well as vegetation structure and potential species to be expected.

3. Objectives

The Ecological Impact Assessment included a vegetation and habitat survey in order to meet the following objectives:

- Identify and list significant species encountered on the proposed project area and list any protected and/or Red Data Listed species;
- Determine and discuss the condition and extent of degradation and/or transformation of the vegetation on the proposed project area;
- Determine and discuss the ecological sensitivity and significance of the proposed project area;
- Identify, evaluate and rate the potential impacts of the proposed project on the natural environment; and,
- Provide recommendations on mitigation and management measures in order to attempt to reduce/alleviate these identified potential impacts.

Wetland delineation:

The protection of wetlands is of utmost importance to the Department of Environmental Affairs (DEA) and Department of Water and Sanitation (DWS). A wetland delineation and assessment was not included in the scope of works. A recommendation is to conduct a thorough wetland delineation and Risk Matrix to establish the extent of any wetland present on site and determine the present ecological

state (PES) and Environmental Importance and Sensitivity (EIS) of the wetland to ensure protection of the wetland. The Risk Matrix can be submitted as part of the General Authorisation process when applying for the Water Use License Application (WULA).

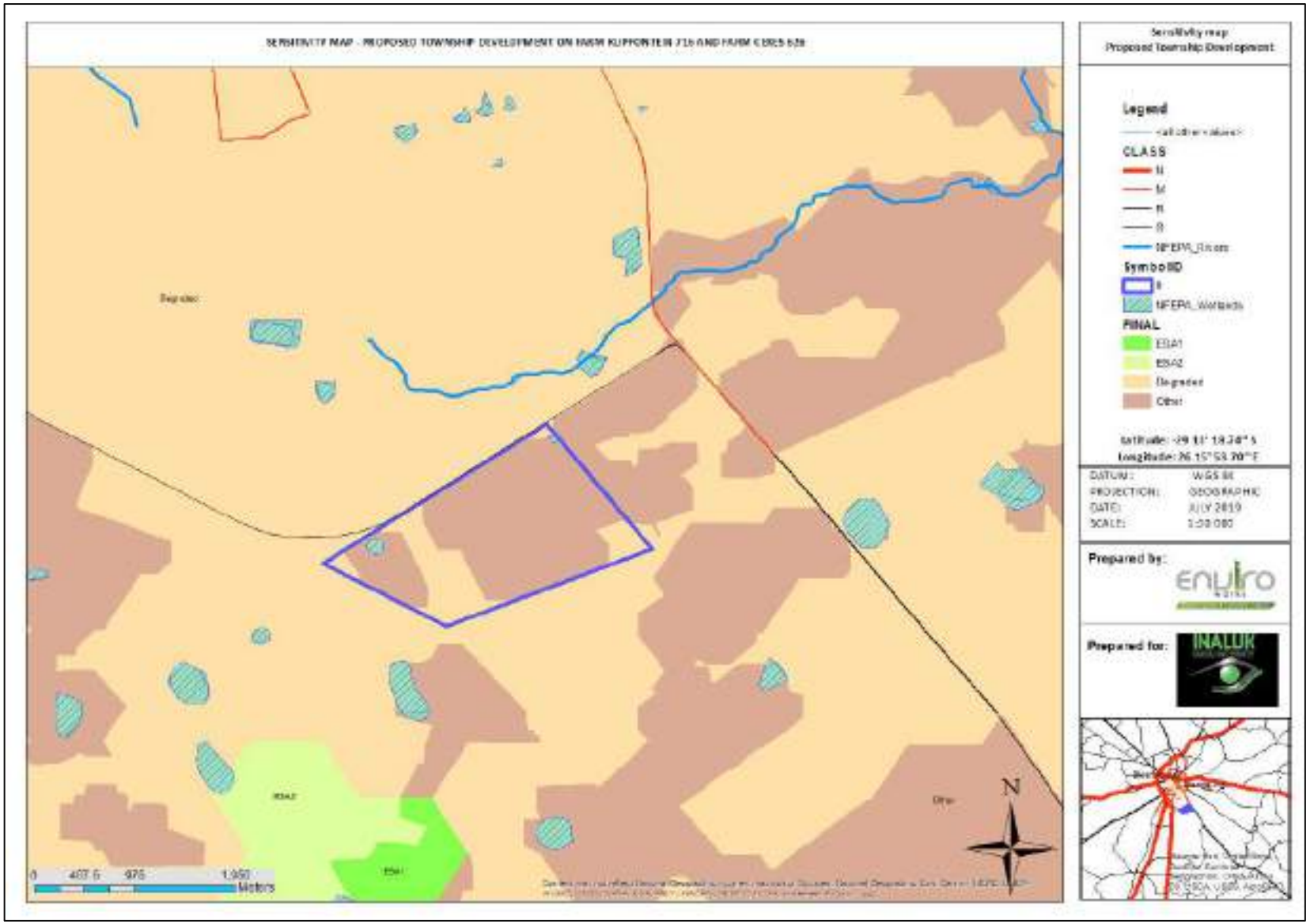


Figure 2 – Sensitivity map, indicating the development footprint of the proposed township

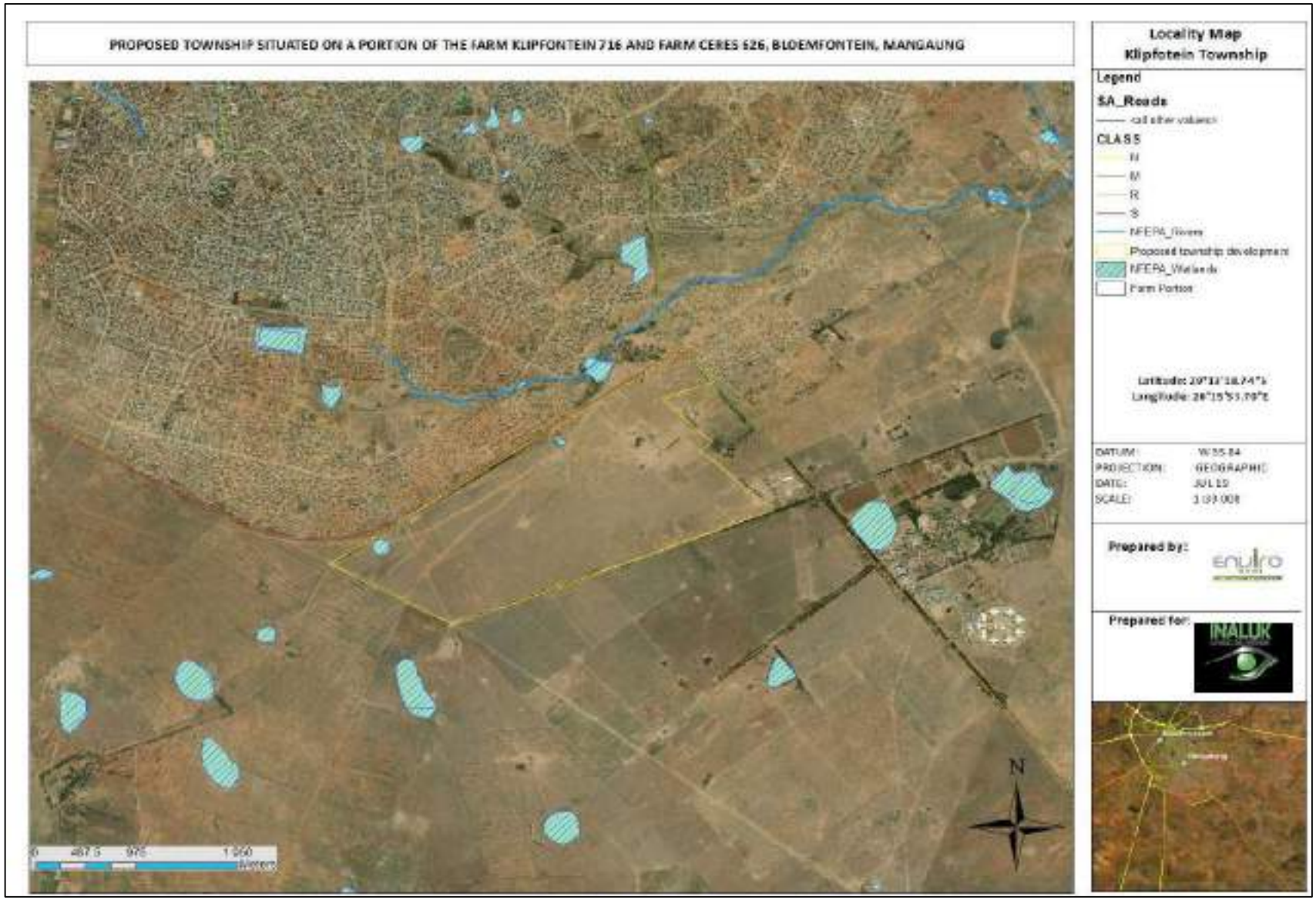


Figure 3 - Locality Map for the area evaluated for the proposed township development

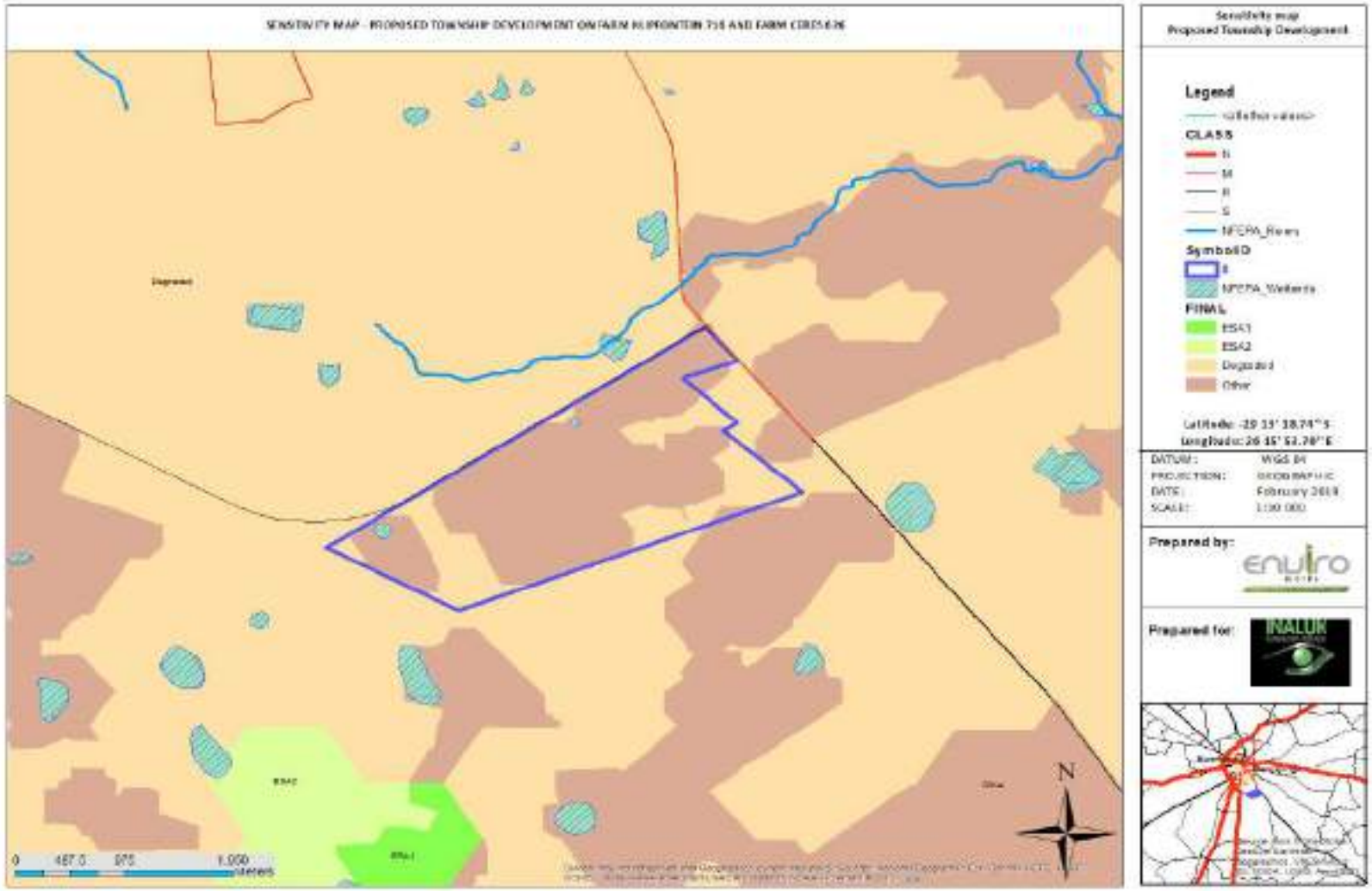


Figure 4 - Sensitivity Map for the area evaluated for the proposed township development.

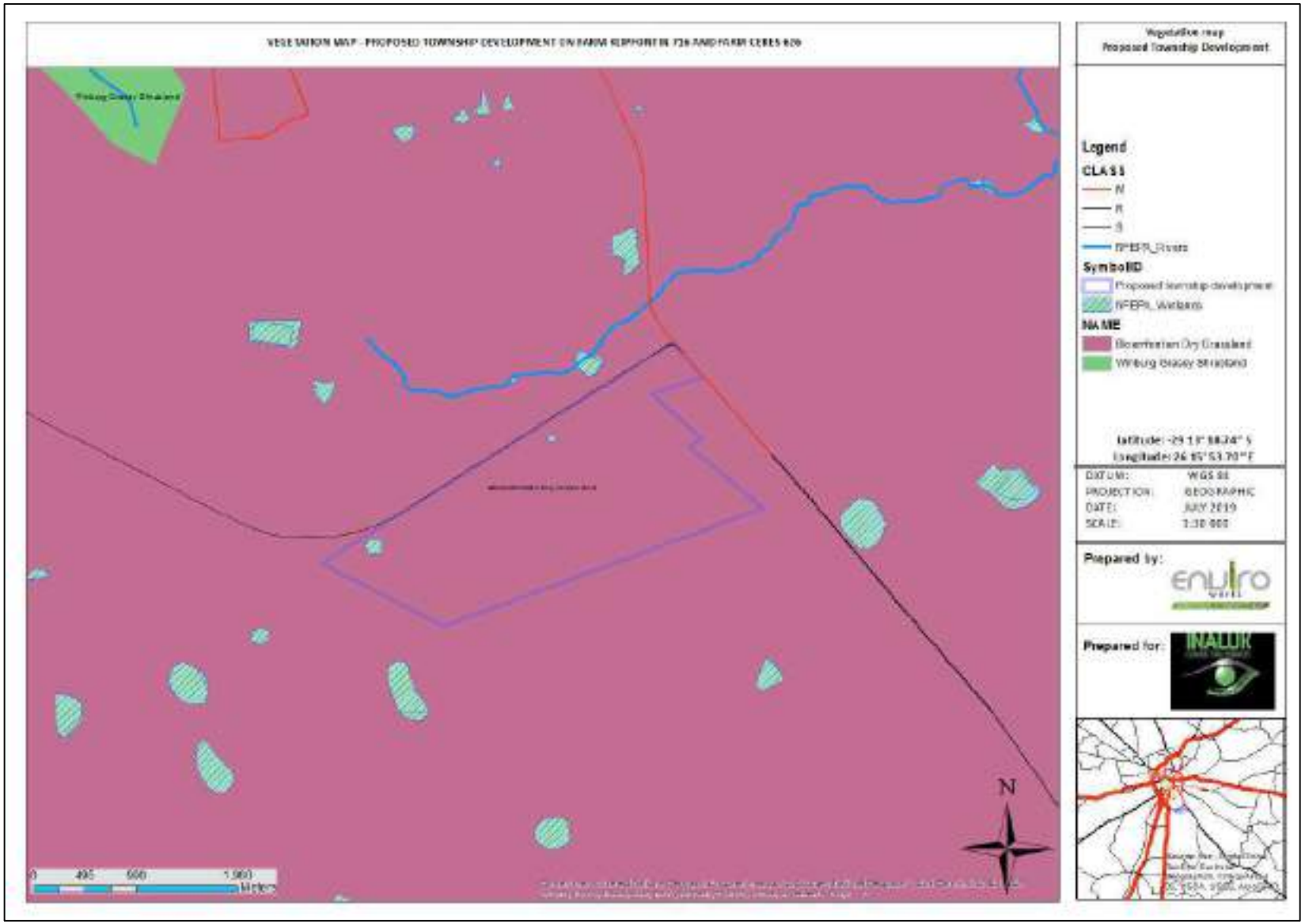


Figure 5 - Vegetation map of the proposed township development and surrounds

4. Assessment Rational

The protection and maintenance of the integrity of our natural resources in South Africa is essential when it comes to the wellbeing of the environment. Continued development however also forms a pillar stone in the socio-economic improvement of society and the livelihoods of communities and individuals. Socio-economic progress can therefore not simply be completely discarded for the sake of environmental conservation but solutions rather need to be determined in order to achieve a sustainable balance between the needs for environmental conservation without unreasonably jeopardising the requirements of socio-economic development. Adequate, sustainable and responsible utilisation and management of our natural resources is crucial and finding these essential environmental/socio-economic balances to achieve sustainability should therefore always be a priority focus point during any proposed project development.

Various environmental legislation in South Africa makes provision for the protection of our natural resources and the functionality of ecological systems in order to ensure sustainability. Such acts include the National Environmental Management: Biodiversity Act (Act 10 of 2004), National Forests Act (Act 84 of 1998), Conservation of Agricultural Resources Act (Act 43 of 1983) and framework legislation such as the National Environmental Management Act (Act 10 of 2004) and Free State Nature Conservation Ordinance (No 8 of 1969).

The various components of ecological systems are all interrelated and it is therefore important that specialist studies of all such components be conducted prior to the commencement of any proposed project development. Only once the potential impacts and outcomes of proposed developments on the ecological systems of an area are understood, can informed decisions be made regarding the viability of projects to address and achieve the environmental and socio-economic needs of an area.

An Ecological Impact Assessment of the proposed project area was therefore conducted in order to determine and quantify the potential impacts of the proposed development on the natural environment.

5. Methodology

The whole proposed footprint area was evaluated (in transects) for the scope of this ecological study. The proposed project area was walked on foot and visual observations/identifications of species in the footprint were conducted.

In order to analyse the significance of species observations, data sources from literature were consulted and include the following:

5.1. Vegetation types:

- Vegetation types and their conservation status were extracted from the South African National Vegetation Map (Mucina and Rutherford, 2006) and the National List of Ecosystems that are Threatened and in Need of Protection (GN 1002 of 9 December 2012).
- A brief discussion on the vegetation type in which the study area is situated, using available literature, in order to place the study area in context (Mucina and Rutherford, 2006).
- A broad-scale map was generated of the vegetation and habitat sensitivity of the site using available GIS data (BGIS, 2018).
- List of plant species were recorded during the survey. Plants were identified from photographs and specimens taken on site.
- The conservation status of the species in the list was also extracted from the Threatened Species Programme, Red List of South African Plants version 2017.1 database (SANBI, 2016).
- Wetland areas were identified by conducting a desktop study before the site visit using National Wetland Map 5 (NWM5) (van Deventer et al. 2019) and Free State Wetland Probability map. The wetlands on site will was mentioned, but not delineated as part of this scope of works.

5.2. Date, season and identification of transects of the site visit:

The site visit took place on Thursday 23 July 2019 (Winter). A walkthrough was done, assessing environmental conditions and pictures were taken of the proposed footprint and plant species occurring on site. During the desktop study, transect lines were identified after dividing the area into homogenous habitat areas in order to sample the proposed construction area as thorough as possible. As the site visit was conducted in the winter, and therefore not in flowering season, a recommendation will be made that a botanical walkthrough be conducted in the rain season (Summer), before the commencement of construction activities in order to detect if any plant species might have been missed during the initial site visit.

The transect lines that was sampled can be seen in Figure 6.

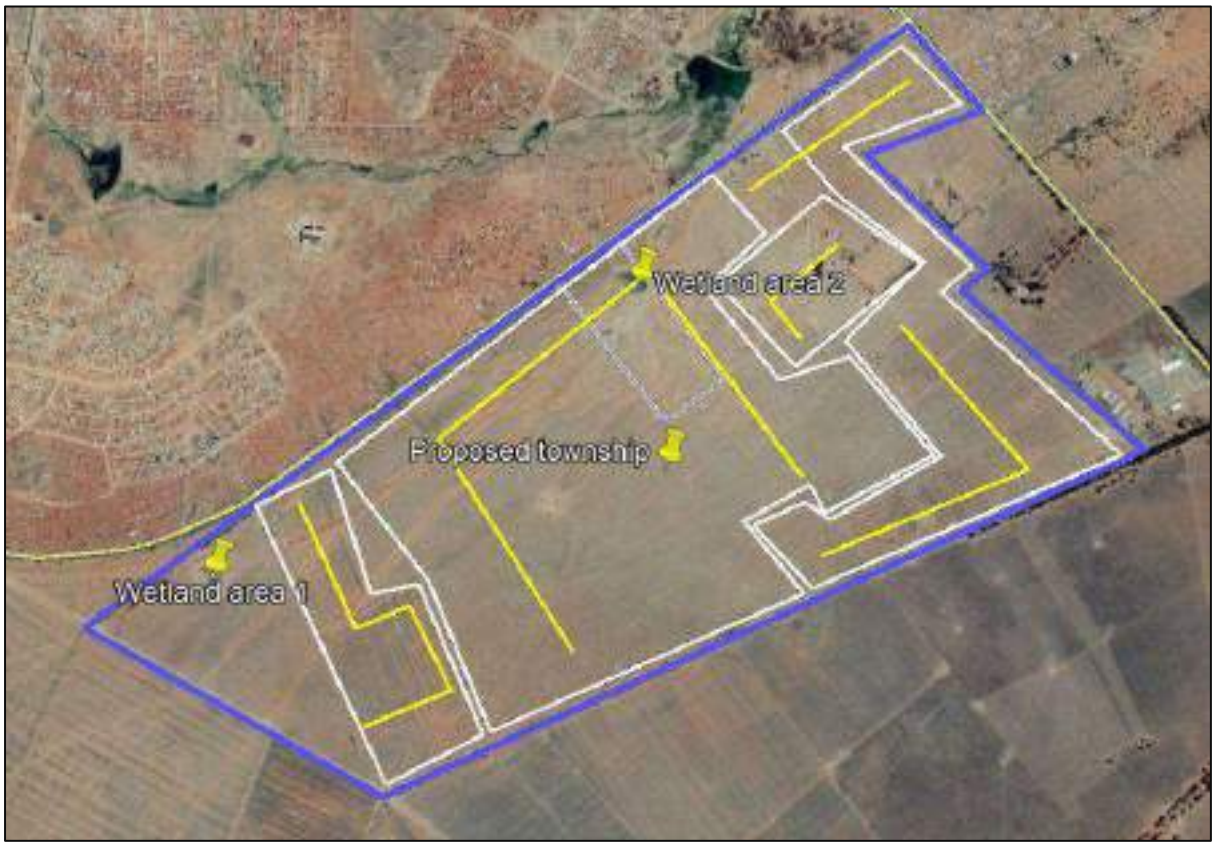


Figure 6 - Transect lines (yellow) and homogenous areas (white) were identified

5.3. Fauna:

- Lists of avifauna, mammals, reptiles and amphibians which are likely to occur at the site were based on distribution records from literature and various spatial databases available from The Virtual Museum (ADU, 2019) and South African Bird Atlas Project (SABAP2, 2019).
- The faunal species lists provided are based on species which are known to occur in the broad geographical area (QDS 2926AB), as well as an assessment of the availability and quality of suitable habitat at the site.
- The conservation status of each species is listed, based on the IUCN Red List Categories and Criteria version 2014.2. These lists are adequate for mammals and amphibians, the majority of which have been assessed, however the majority of reptiles have not been assessed and therefore, it is not adequate to assess the potential impact of the development on reptiles, based on those with a listed conservation status alone. The conservation status of avifauna was checked against an international database (Birdlife, 2019).

5.4. Impact ratings Methodology:

Potential impacts of the proposed project on the surrounding natural environment were identified, evaluated and rated as per the methodology described below.

The tables below indicate and explain the methodology and criteria used for the evaluation of the **Environmental Risk Ratings** as well as the calculation of the final **Environmental Significance Ratings** of the identified potential ecological impacts.

Each potential environmental impact is scored for each of the **Evaluation Components** as per the Table 4 below.

Table 2 Scale utilised for the evaluation of the Environmental Risk Ratings

Evaluation Component	Rating Scale and Description/criteria
MAGNITUDE of NEGATIVE IMPACT (at the indicated spatial scale)	**10 - Very high**: Bio-physical and/or social functions and/or processes might be *severely* altered. **8 - High**: Bio-physical and/or social functions and/or processes might be *considerably* altered. **6 - Medium**: Bio-physical and/or social functions and/or processes might be *notably* altered. **4 - Low** : Bio-physical and/or social functions and/or processes might be *slightly* altered. **2 - Very Low**: Bio-physical and/or social functions and/or processes might be *negligibly* altered. **0 - Zero**: Bio-physical and/or social functions and/or processes will remain *unaltered.*
MAGNITUDE of POSITIVE IMPACT (at the indicated spatial scale)	**10 - Very high (positive)**: Bio-physical and/or social functions and/or processes might be *substantially* enhanced. **8 - High (positive)**: Bio-physical and/or social functions and/or processes might be *considerably* enhanced. **6 - Medium (positive)**: Bio-physical and/or social functions and/or processes might be *notably* enhanced. **4 - Low (positive)**: Bio-physical and/or social functions and/or processes might be *slightly* enhanced. **2 - Very Low (positive)**: Bio-physical and/or social functions and/or processes might be *negligibly* enhanced. **0 - Zero (positive)**: Bio-physical and/or social functions and/or processes will remain *unaltered.*
DURATION	**5 - Permanent** **4 - Long term**: Impact ceases after operational phase/life of the activity > 60 years. **3 - Medium term**: Impact might occur during the operational phase/life of the activity – 60 years. **2 - Short term**: Impact might occur during the construction phase - < 3 years. **1 - Immediate**
EXTENT (or spatial scale/influence of impact)	**5 - International**: Beyond National boundaries. **4 - National**: Beyond Provincial boundaries and within National boundaries. **3 - Regional**: Beyond 5 km of the proposed development and within Provincial boundaries. **2 - Local**: Within 5 km of the proposed development.

	1 - Site-specific: On site or within 100 m of the site boundary. **0 -** None
IRREPLACEABLE loss of resources	**5 – Definite** loss of irreplaceable resources. **4 – High** potential for loss of irreplaceable resources. **3 – Moderate** potential for loss of irreplaceable resources. **2 – Low** potential for loss of irreplaceable resources. **1 – Very low** potential for loss of irreplaceable resources. **0 - None**
REVERSIBILITY of impact	**5 –** Impact **cannot** be reversed. **4 – Low** potential that impact might be reversed. **3 – Moderate** potential that impact might be reversed. **2 – High** potential that impact might be reversed. **1 –** Impact **will be** reversible. **0 –** No impact.
PROBABILITY (of occurrence)	**5 - Definite**: >95% chance of the potential impact occurring. **4 - High probability**: 75% - 95% chance of the potential impact occurring. **3 - Medium probability**: 25% - 75% chance of the potential impact occurring **2 - Low probability**: 5% - 25% chance of the potential impact occurring. **1 - Improbable**: <5% chance of the potential impact occurring.
CUMULATIVE impacts	**High**: The activity is one of several similar past, present or future activities in the same geographical area, and might contribute to a very significant combined impact on the natural, cultural, and/or socio-economic resources of local, regional or national concern. **Medium**: The activity is one of a few similar past, present or future activities in the same geographical area, and might have a combined impact of moderate significance on the natural, cultural, and/or socio-economic resources of local, regional or national concern. **Low**: The activity is localised and might have a negligible cumulative impact. **None**: No cumulative impact on the environment.

Once the **Environmental Risk Ratings** have been evaluated for each potential ecological impact, the **Significance Score** of each potential ecological impact is calculated by using the following formula:

- **SS (Significance Score) = (magnitude + duration + extent + irreplaceable + reversibility) x probability.**

The maximum **Significance Score** value is 150.

The **Significance Score** is then used to rate the **Environmental Significance** of each potential ecological impact as per Table 5 below. The **Environmental Significance** rating process is completed for all identified potential ecological impacts both before and after implementation of the recommended mitigation measures.

Table 3 Scale used for the evaluation of the Environmental Significance Ratings

Significance Score	Environmental Significance	Description/criteria

125 – 150	**Very high (VH)**	An impact of very high significance will mean that the project cannot proceed, and that impacts are irreversible, regardless of available mitigation options.
100 – 124	**High (H)**	An impact of high significance which could influence a decision about whether or not to proceed with the proposed project, regardless of available mitigation options.
75 – 99	**Medium-high (MH)**	If left unmanaged, an impact of medium-high significance could influence a decision about whether or not to proceed with a proposed project. Mitigation options should be relooked.
40 – 74	**Medium (M)**	If left unmanaged, an impact of moderate significance could influence a decision about whether or not to proceed with a proposed project.
<40	**Low (L)**	An impact of low is likely to contribute to positive decisions about whether or not to proceed with the project. It will have little real effect and is unlikely to have an influence on project design or alternative motivation.
+	**Positive impact (+)**	A positive impact is likely to result in a positive consequence/effect, and is likely to contribute to positive decisions about whether or not to proceed with the project.

6. Assumptions, uncertainties and gaps in knowledge

A part of the assessment depends on the desktop study to determine what important and endemic species are known to occur in the area and which are most likely to occur in the proposed sites' vegetation. A site visit was also done to confirm the species that occur in the proposed development area.

The processes of investigation which have led to the production of this report, harbours several assumptions, which include the following:

- All information provided by the applicant to the environmental specialist was correct and valid at the time that it was provided;
- The proposed project footprint as provided is correct and will not be significantly deviated from;
- Strategic level investigations undertaken by the applicant prior to the commencement of the EIA process, determined that the development site represents a potentially suitable and technically acceptable location;
- The public will receive a fair and reoccurring opportunity to participate and comment during the EIA process, through the provision of adequate public participation timeframes stipulated in the Regulations;
- The need and desirability of the project is based on strategic national, provincial and local plans and policies which reflect the interests of both statutory and public viewpoints;

- The EIA process is a project-level framework and the specialists are limited to assessing the anticipated environmental impacts associated with the construction and operational phases of the proposed project;
- Strategic level decision making is conducted through cooperative governance principles with the consideration of sustainable and responsible development principles underpinning all decision making;
- Given that an EIA involves prediction, uncertainty forms an integral part of the process. Two types of uncertainty are associated with the EIA process, namely process-related and prediction-related:
    - Uncertainty of prediction is critical at the data collection phase as final certainty will only be obtained upon implementation of the proposed development. Adequate research, experience and expertise may minimise this uncertainty;
    - Uncertainty of values depicts the approach assumed during the EIA process, while final certainty will be determined at the time of decision making. Enhanced communication and widespread/comprehensive coordination can lower uncertainty;
- Uncertainty of related decision relates to the interpretation and decision making aspect of the EIA process, which shall be appeased once monitoring of the project phases is undertaken;
- The significance/importance of widespread/comprehensive consultation towards minimising the risk/possibility of omitting significant impacts is further stressed. The use of quantitative impact significance rating formulas (as utilised in this document) can further standardise the interpretation of results and limit the occurrence and scale of uncertainty;
- The initial study was undertaken as a desktop assessment and as such, the information gathered must be considered with caution, as inaccuracies and data capturing errors are often present within these databases; and,
- Global Positioning System (GPS) technology is inherently inaccurate and some inaccuracies due to the use of handheld GPS instrumentation may occur.
- Some plant species might have been missed during the site visit due to the fact that the assessment was done in winter. It is recommended that a botanical walkthrough be conducted before construction commences, to detect any flowering species that were missed before, if any.

Gaps in knowledge can be attributed to:

The ecological study process is being undertaken prior to the availing of certain information which would be derived from the final project design and layout.

- The principle of human nature provides for uncertainties with regards to the identified socio-economic impacts of the proposed development.
- Enviroworks is an independent environmental consulting firm and as such, all processes and attributes of the specialist investigations and EIA are addressed in a fair and unbiased/objective manner. It is believed that through the running of a transparent and participatory process, risks associated with assumptions, uncertainties and gaps in knowledge can be and have been acceptably reduced.

7. Receiving Environment

The proposed development footprint is located across the road from an already established township area (near Kopanong) and approximately 193 ha in surface size, situated within the Mangaung Metropolitan Municipality, Free State Province. The site is situated partly adjacent to Dewetsdorp Road and the M30, approximately 17 km outside Bloemfontein central with the following coordinates: 29° 12’ 55.95” S and 26° 15’ 51.58” E. The proposed footptint is situated on a Portion of the Farm Klipfontein 716 and Farm Ceres 626.

A brief discussion on the vegetation type in which the study area is situated follows, using available literature, in order to place the study in context where after a broad-scale map was generated of the vegetation and habitat sensitivity of the site using available GIS data. The surrounding areas are mostly affected and degraded by anthropogenic activities such as farming activities, housing developments, cattle grazing and clearing of vegetation. Adjacent to the proposed footprint there are existing buildings and various construction activities, including an existing township within close vicinity of the proposed site. Further, a shooting range is also established on the adjacent premises to the south-eastern side of the site. Illegal dumping, grazing activities and alien invasive infestation occurs on the site.

7.1. Vegetation:

The study area and project site is situated within the Grassland Biome and Dry Highveld Grassland bioregion. The proposed project area forms part of the (Gh5) Bloemfontein Dry Grassland vegetation type (Mucina & Rutherford, 2006).

The proposed project area also falls inside an area categorised by the Provincial Spatial Biodiversity Plan as ‘Other” and “Degraded”. ‘Other Natural Areas’ are production landscapes with the objective

to manage land to optimize sustainable utilization of natural resources (Adapted from the guidelines for bioregional plans (Anon 2008)). See sensitivity and vegetation maps (Figures 4 and 5).

The distribution of the vegetation type as found on the site is limited to the Free State Province and can mainly be found at altitudes of 1250-1480m. This vegetation type has been described by Mucina and Rutherford (2009) to usually occur in landscape types such as undulating bottomland landscapes covered with tall, dense grassland alternating with patches of karroid schrubs.

The geology consists out of sedimentary mudstones and layers of sandstone mainly of the Adelaide subgroup (Beaufort Group, Karoo Supergroup). The Volksrust Formation mudstones of the Ecca Group dominate the western part while a deep layer of red sand (300 mm) covers the clayey B-horizon. Ca and Ae types are nearly equally represented. This vegetation type is situated in a summer rainfall area with MAP of about 450mm. Important taxa include Graminoids such as *Anthephora pubescens, Aristida congesta, A. Diffusa, Cynodon dactylon, Digitaria argyrograpta* to name a few. Also found in this area are herbs, geophytic herbs, succulent herbs, low shrubs and succulent shrubs.

Table 4: Conservation status of the vegetation type occurring in and around the study area

Vegetation Type	Target (%)	Conserved (%)	Transformed (%)	Conservation Status Driver *et al.*, 2005; Mucina & Rutherford, 2006
Bloemfontein Dry Grassland	24%	Small portion	40%	Endangered

According to Mucina and Rutherford (2006) the vegetation type (i.e Bloemfontein Dry Grassland) has a very small portion that is conserved statutorily in Soetdoring Nature reserve. Some 40% are already transformed, mainly due to crop production. The conservation status is classified as Endangered.

The land cover of the proposed development site currently consists of large areas of bare compacted soil with little to medium vegetation cover present on site. The area has been degraded in the past by clearance of the natural vegetation. By evaluating historical images of the year 2000 it is evident that a large part of the proposed area was utilized for crop production (Figure 7). Due to the transformation of natural land cover in the surrounding areas, the likelihood of the area restoring to an important ecological functioning unit is highly unlikely, if not impossible, considering the surrounding construction, degradation and disturbances on the proposed site. See vegetation and sensitivity maps (Figures 4 and 5). However, there are some areas on the site which still contains characters of the natural vegetation type characterising the area.

7.2. Climate:

The project area normally receives about 450mm of rain per year, with most rainfall occurring mainly during summer. It receives the lowest rainfall in July and the highest in March. The mean annual temperature (MAT) of the region is approximately 15.7°C. The region is the coldest during July with high incidence of frost in the winter.

7.3. Topography and Drainage:

The proposed site for the township is located in quaternary catchment C52F. The general flow of water on site will be in a north eastern direction, when evaluating the positions of the dam walls and site topography. The topography found at the proposed construction area is relatively flat. As this is a large area, slopes occur towards various directions, however, the overall slope tends towards the north eastern direction.

7.4. Fauna of conservation concern

Species known to occur from the Quarter Degree Square (QDS, 2926AB) were extracted from the Animal Demography Unit website (ADU, 2019) and the Second South African Bird Atlas (SABAP2, 2019). Reporting rates for birds observed in the QDS are listed below (Table 6). No species of conservation concern have been observed in the QDS.

Figure 7 – Google Earth screenshot of the proposed area in the year 2000 showing agricultural activities, including cultivated fields

Figure 8 - Wetland area 1, Artificial watercourse 1 and Artificial watercourse 2 (artificial watercourses) as identified on the proposed township development area

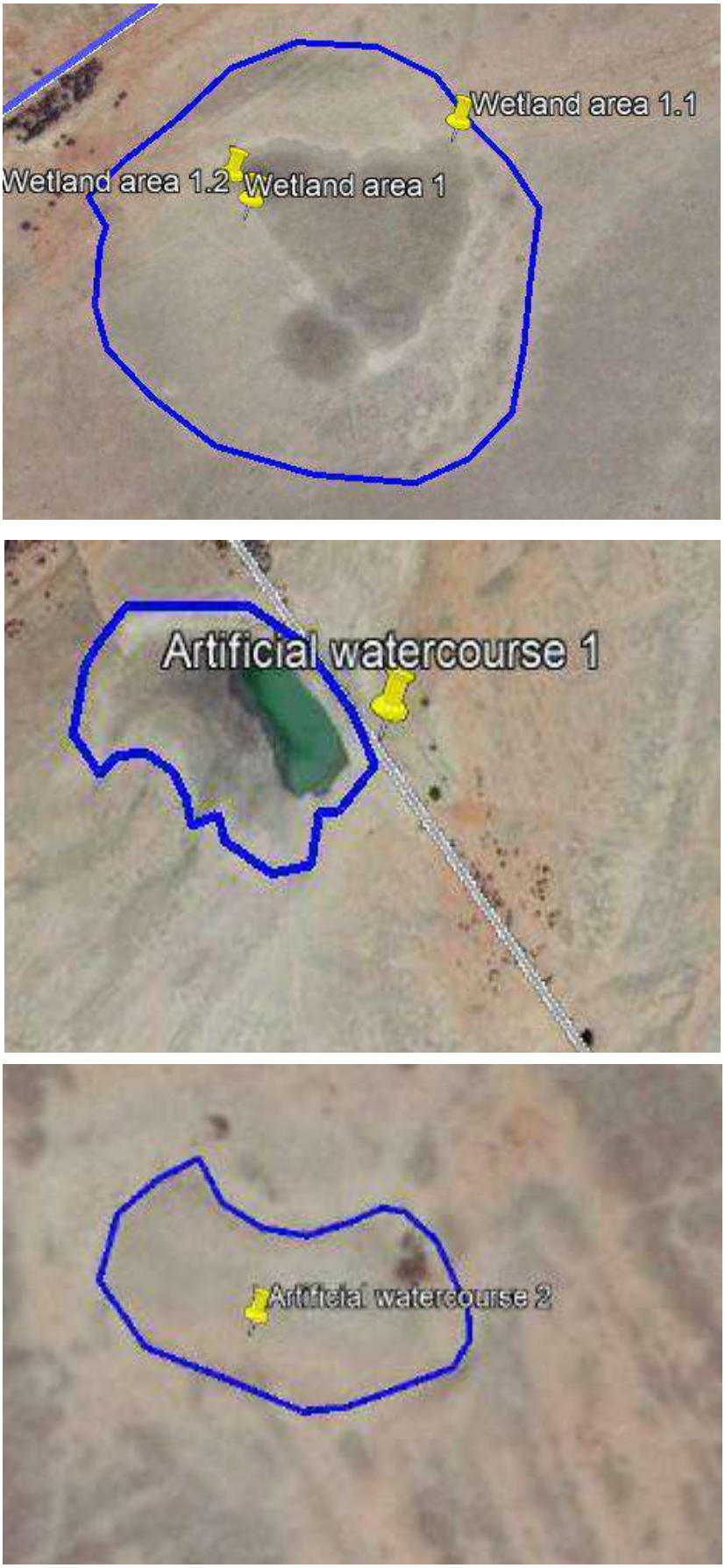


Figure 9 - Google Earth images showing the wetland areas

8. Results

8.1. Vegetation:

The proposed footprint forms part of an area classified by the Critical Biodiversity Area map of the Free State Province as partly 'Degraded' and partly 'Other natural areas' (Figure 4). The vegetation present on site is not typically representative of the Bloemfontein Dry Grassland vegetation type, although some areas (small parts) appears to show signs of the natural vegetation type representation. The vegetation as found on site are dominated by grasses while indigenous, non-indigenous and alien invasive species occur in the proposed footprint.

8.2. Site specific vegetation:

Rare plant species are classified either as protected species in the National Forests Act (Act 84 of 1998 as amended in 2005) and Nature and Environmental Conservation Ordinance (No.19 of 1974) or as Red Data species according to the Red Data List of Southern African Plants (2017). The Red Data species are classified in several categories such as Endangered, Vulnerable, Rare and Not Threatened. Species that are endemic to a certain area are important in terms of conservation status as their distribution may be very localized and as such may be threatened by new developments, be it housing, industrial or mining. However, endemic species may, or may not be listed as Red Data or protected species.

Grasses dominate the vegetation in the area with various shrubs and trees present. The disturbance on the property include vehicle tracks and clearance of vegetation. Ongoing disturbance has made this area vulnerable to invasion by weeds and other alien invasive species. Various trees were found on mostly the edges of the proposed development site as the area was used for agricultural purposes in the past (see Figure 7). The area is heavily degraded by cattle, vehicle tracks, illegal waste dumping and clearing of vegetation. Some of the residents of the existing township from across the road are already allocating and demarking areas for houses to be built on site.

The list below contains the plant species observed on the proposed development during the site visit but are not limited to the following:

Table 5 Species list of plants that were encountered during the survey.

Species	Common Name	Family	Origin	Conservation Status (Redlist)
Agave americana variegata	Spreading century plant	Agavaceae	Category 3 in Western Cape and Not listed elsewhere in South Africa.	Least concern

Argemone ochroleuca	White flowered Mexican poppy	Papaveraceae	Not Endemic – invasive – NEMBA Category 1b	N/A
Aristida canescens	Pale Three Awn Grass	Poaceae	Not Endemic - indigenous	Least concern
Aristida congesta subsp. congesta	Buffalo Grass	Poaceae	Not Endemic to South Africa	Least concern
Asparagus laricinus	Cluster-leaf asparagus	Asparagaceae	Not Endemic to South Africa	Least concern
Carthamus lanatus	Woolly distaff thistle	Asteraceae	Not Endemic – invasive – NEMBA Category 1b	N/A
Casuarina cunninghamiana	River Oak	Casuarinaceae	Not Endemic – invasive – NEMBA Category 2	N/A
Chloris virgata	Blougras	Poaceae	Not Endemic to South Africa	Least concern
Datura stramonium	Jimsonweed	Solanaceae	Not Endemic – invasive - NEMBA Category 1b	N/A
Digitaria eriantha	Bloukruisgras	Poaceae	Not Endemic to South Africa	Least concern
Digitaria sanguinalis	Summer grass	Poaceae	Not Endemic to South Africa	Least concern
Eragrostis curvula	Weeping lovegrass	Poaceae	Not Endemic to South Africa	Least concern
Eucalyptus camaldulensis	River red gum	Myrtaceae	Not listed within cultivated land that is at least 50 metres away from untransformed land. Otherwise category 1B	N/A
Eucalyptus cladocalyx	Sugar gum	Myrtaceae	Category 1B	N/A
Euphorbia polygona	Bobbejannoors	Euphorbiaceae	Endemic to South Africa	Least concern
Felicia spp.	-	Asteraceae	-	-
Flacourtia indica	ramontchi	Salicaceae	Not Endemic to South Africa	Least concern
Juncus effusus	Common rush	Juncaceae	Not Endemic to South Africa – freshwater systems	Least concern
Leptochloa fusca	Kuilgras	Poaceae	Not Endemic to South Africa – freshwater systems	Least concern
Moraea pallida	Cape Tulip	Iridaceae	Not Endemic to South Africa	Least concern
Nenax microphylla	Daggabossie	Rubaceae	Not Endemic to South Africa	Least concern
Opuntia ficus indica	Mission prickly pear	Cactaceae	Not Endemic – invasive – NEMBA Category 1b	N/A
Panicum spp.	-	Poaceae	-	-
Pennisetum clandestinum	Kikuyu Grass	Poaceae	Not Endemic to South Africa	Least concern

Phoenix canariensis chabaud	Canary Island date palm	Arecaceae	Not Endemic to South Africa	Least concern
Pollichia campestris	Waxberry	Caryophyllaceae	Not Endemic to South Africa	Least concern
Senecio consanguineus	Springkaanbossie	Asteraceae	Not Endemic - indigenous	Least concern
Solanum elaeagnifolium	Silver leaf bitter apple	Solanaceae	Not Endemic – invasive – NEMBA Category 1b	N/A
Stenocerus thuberi	Organ pipe cactus	Cactaceae	Not Endemic to South Africa	Least concern
Themeda Triandra	Red grass	Poaceae	Not Endemic - indigenous	Least concern
Tragus racemosa	Burr grass	Poaceae	Not Endemic to South Africa	Least concern
Vachellia robusta	Cape thorn tree	Fabaceae	Not Endemic to South Africa	Least concern
Ziziphus mucronata	Blinkblaar	Rhamnaceae	Not Endemic to South Africa	Least concern

8.3. Evaluation:

The area of the proposed township development is situated on a degraded piece of land. The sites' original vegetation was damaged due to previous vegetation clearing for agricultural purposes, housing plot marking, and gravel roads, cattle grazing, a soccer field and illegal dumping of waste. Access roads leading to the site are existing as the surrounding areas towards the western, northern and eastern sides are already heavily developed. There are three areas on site where the vegetation indicate areas of wetness (*Juncus effuses* and *Leptochloa fusca*). One of the sites is situated towards the western side of the property and the other two areas, towards the northern side (artificial watercourse 1) and towards the south-western side (artificial watercourse 2) (Figure 8 and 9). The identified wetland areas will likely be affected directly by the proposed project as it is situated inside area of planned construction of the proposed township development (Figure 8 and 9). The layout plan makes provision for the wetlands by including them into the public open spaces and mitigations must be implemented in order to mitigate impacts on these watercourses during construction and operation. A recommendation is to conduct a thorough wetland delineation and Risk Matrix in order to determine the extent and importance, ecologically, of these wetland areas on site.

The proposed area for the township development is already modified by the disruption in natural vegetation composition, structure and ecosystem functioning due to previous activities that took place on the specific site. At a local scale the site is degraded. No species of conservation concern were found present or are likely expected to be present. The property is surrounded by transformed and degraded habitat making recovery to a functional and representative ecosystem highly unlikely and very slow.

The proposed construction area falls inside an area classified as 'Degraded' and 'Other' by the Sensitivity map (Figure 2). Previous transformation and destruction of portions of the site results in it not fulfilling the physical and functional role in order to be deemed a representative sample of the vegetation type, which forms part of the Bloemfontein Dry Grassland vegetation type - classified as Endangered. This property is not of high conservation significance for habitat preservation or ecological functionality persistence in support of the surrounding ecosystem or broader vegetation type. All alien invasive plants must be located, removed and destroyed by burning in controlled conditions. No alien invasive plants must be left in a condition to bear fruit, to spread by seed dispersal or propagate through vegetative means.

It is anticipated that the development will have a low level of impact on the conservation status of the vegetation type and the ecological functioning of the ecosystem. The reason for the latter is because of the low significance of the current state of the vegetation found on the site. It is further recommended that the excavation and construction be restricted to the footprint in order to preserve the surrounding natural areas that might still be intact.

Due to land availability and service connections, the proposed site is the only site that has been identified for establishing a township during the consultation process with the Local Municipality. Therefore, no alternative site has been identified or considered during this study.

The proposed construction of the proposed township development will transform the existing surface vegetation inside the development footprint as most to all vegetation within the project footprint will be cleared during the construction phase. The surface hardness and roughness of the footprint will also be changed due to vegetation removal, possible compaction, paving of surfaces and excavation on the premises.

The area is modified and degraded by the disruption in natural vegetation composition, structure and ecosystem functioning due to previous activities, soil compaction and clearance of vegetation. A loss of natural habitat, biota and basic ecosystem functions has occurred. The latter because of the fact that the area is degraded as well as partly invaded by invasive species. However, the development will add to the cumulative disturbance to the ecosystem structure and function, caused by the previous disturbance on the proposed site. The latter because of the fact that most vegetation will be cleared and construction of a human settlement will take place.

The area is not ecologically important and sensitive at any scale. Biodiversity is usually ubiquitous and not sensitive to flow and habitat modifications. It is classified as a Degraded Area although the vegetation type (when in pristine condition) is classified as Endangered. At a local scale the site is

degraded and poses very little significance ecologically. No species of conservation concern were found present or are likely expected to be present. The property is surrounded by transformed land cover, mainly housing and previous agricultural activities, making recovery to a functional and representative ecosystem unlikely and very slow.

This section is not of high conservational significance for habitat preservation or ecological functionality persistence in support of the surrounding ecosystem or broader vegetation type.

8.4. Wetlands on site:

The sensitivity map indicated two (2) NFEPA wetland areas to be present on site (Figure 4). The National Wetland map5 (NWM5) and Free State Wetland Probability map data were used in determining the wetland areas during the desktop study. However, an additional artificial watercourse (Artificial watercourse 2) was identified during the site visit. The latter falls outside the scope area of the project (Figure 1).

8.5. Fauna evaluation and found on site:

No fauna other than *Suricata suricatta* (meerkat) was found at the site. Evaluating the area showed signs of animals present (manure and footprints). The latter mainly refer to introduced animals grazing on the premises.

Table 6 Bird of conservation concern known from the QDS 2926AB, records from 1980 to present from ADU (2019a; 2019b).

Family	Scientific name	Common name	No. of Records	Last recorded	SA Endemic	Redlist category
Alcedinidae	*Alcedo cristata*	Malachite Kingfisher	1	2016-04-24	No	Least Concern
Anatidae	*Anas capensis*	Cape Teal	1	2018-07-10	No	Least Concern
Anatidae	*Anas undulata*	Yellow-billed Duck	1	2015-12-12	No	Least Concern
Ardeidae	*Bubulcus ibis*	Cattle egret	1	2019-01-01	No	Least Concern
Charadriidae	*Charadrius tricollaris*	Three-banded Plover	1	2016-04-24	No	Least Concern
Cisticolidae	*Cisticola tinniens*	Levaillant's (Tinkling) Cisticola	1	2016-04-23	No	Least Concern
Cuculidae	*Chrysococcyx caprius*	Dideric (Diederik) Cuckoo	1	2015-12-12	No	Least Concern
Estrildidae	*Amandava subflava*	Orange-breasted (Zebra) Waxbill	1	2007-02-24	No	Least Concern
Estrildidae	*Estrilda astrild*	Common Waxbill	1	2016-04-24	No	Least Concern

Hirundinidae	*Hirundo albigularis*	White-throated Swallow	1	2009-03-21	No	Least Concern
Hirundinidae	*Ptyonoprogne fuligula*	Rock Martin	1	2014-09-18	No	Least Concern
Hirundinidae	*Riparia paludicola*	Brown-throated (Plain) Martin	2	2010-02-13	No	Least Concern
Jacanidae	*Actophilornis africanus*	African Jacana	1	2018-07-10	No	Least Concern
Motacillidae	*Anthus cinnamomeus*	African (Grassveld/Grassland) Pipit	1	2007-08-01	No	Least Concern
Motacillidae	*Motacilla capensis*	Cape Wagtail	1	2009-03-21	No	Least Concern
Muscicapidae	*Saxicola torquatus*	African (Common) Stonechat	3	2018-07-10	No	Least Concern
Phoenicopteridae	*Phoenicopterus roseus*	Greater Flamingo	1	2016-07-28	No	Least Concern
Ploceidae	*Euplectes orix*	Southern Red (Red) Bishop	1	2016-04-23	No	Least Concern
Ploceidae	*Plocepasser mahali*	White-browed Sparrow-Weaver	6	2016-10-08	No	Least Concern
Ploceidae	*Ploceus velatus*	Southern Masked Weaver	5	2016-04-24	No	Least Concern
Pycnonotidae	*Pycnonotus nigricans*	African Red-eyed Bulbul	1	2016-04-23	No	Least Concern
Rallidae	*Fulica cristata*	Red-knobbed Coot	1	2015-12-14	No	Least Concern
Rallidae	*Gallinula chloropus*	Common Moorhen	2	2015-12-14	No	Least Concern
Rhinopomastidae	*Rhinopomastus cyanomelas*	Common Scimitarbill	1	2009-03-21	No	Least Concern
Scolopacidae	*Phalaropus fulicaria*	Red (Grey) Phalarope	2	2018-03-03	No	Least Concern
Scopidae	*Scopus umbretta*	Hamerkop	1	2016-04-24	No	Least Concern
Sylviidae	*Acrocephalus gracilirostris*	Lesser Swamp-(Cape Reed) Warbler	1	2016-04-24	No	Least Concern

No listed dung beetles are found (DungBeetleMAP, 2019) in the QDS. No Neoroptera, Megaloptera, butterflies nor Odonata of conservation concern are known from the QDS (LacewingMAP, 2019; OdonataMAP, 2019; LepiMAP, 2019). Insects are mobile and can relocate from the development footprint to the adjacent intact vegetation. No listed spiders or scorpions are known to occur in the area and these species are presumed to move away from the construction site due to increased disturbance (ScorpionMAP & SpiderMAP, 2019). No amphibians or reptile of conservation concern are known from the QDS (FrogMAP, 2019; ReptileMAP, 2019).

Several mammals of conservation concern are known from the QDS (MammalMAP, 2019), but due to the agricultural and transformed matrix which surrounds the property there is a lack of suitable

habitat for the species listed in Table 7. It is very unlikely that the property will provide a suitable habitat for these species. The grassland on the property can however by used by domestic animals and smaller roaming mammals, as seen from evidence of their presence, i.e. a small burrow, cow dung and small droppings.

Table 7 Mammals of conservation concern known from the QDS 2926AB, records from 1980 to present from ADU (MammalMAP, 2018).

Family	Scientific name	Common name	Red list category (Child *et al*., 2016)	Number of records	Last recorded
Bovidae	*Damaliscus lunatus lunatus*	(Southern African) Tsessebe	Vulnerable (2016)	2	-
Bovidae	*Damaliscus pygargus pygargus*	Bontebok	Vulnerable (2016)	2	-
Bovidae	*Hippotragus equinus*	Roan Antelope	Endangered (2016)	3	-
Bovidae	*Hippotragus niger niger*	Sable	Vulnerable (2016)	5	-
Equidae	*Equus zebra hartmannae*	Hartmann's Zebra	Vulnerable (2016)	1	-
Felidae	*Leptailurus serval*	Serval	Near Threatened (2016)	1	2012-01-14
Mustelidae	*Aonyx capensis*	African Clawless Otter	Near Threatened (2016)	1	2010-02-13

The property and direct surrounds has a relatively low habitat diversity. The impacts on fauna life is likely to be low because of the already degraded and surrounding areas. Grassland habitat of similar quality is available on the farm adjacent to the proposed development area.

9. Potential Impact Assessment

The following section identifies the potential ecological impacts (both positive and negative) which the proposed project might have on the environment.

Once the potential ecological impacts are identified, they are assessed by rating their Environmental Risk after which the final Environmental Significance is calculated and rated for each identified ecological impact.

The same Environmental Risk rating process is then followed for each ecological impact to determine the Environmental Significance if the recommended mitigation measures were to be implemented.

The objective of this section is therefore firstly to identify the potential ecological impacts of the proposed project and secondly to determine the significance of the impacts and how effective the recommended mitigation measures will be able to reduce their significance.

The following section provides descriptions of the potential ecological impacts which the proposed project will have as well as the recommended mitigation measures to be implemented for each impact as identified. The largest risks of the proposed development are related to the following issues, but are not limited to:

9.1. Spread and establishment of alien invasive species

Soil disturbances from construction will enhance the encroachment of alien invasive vegetation that can outcompete indigenous counterpart species for resources, displace and reduce faunal and floral biodiversity. Clearing current invasive alien species may increase the risk of spreading species if not properly removed and safely transported. Due to the fact that this area is already degraded, with no sensitive vegetation or species of conservation concern on the proposed development site, this will, not be a major point of concern, but may occur because of existing alien invasive species on the site. In instances where this might occur the following mitigation efforts should be implemented:

Mitigation:

- Alien vegetation eradication program should be developed and implemented for the site to remove alien vegetation during all operational phases.
- Follow-up clearing and monitoring should be done to detect any new invasive species establishment and spread during operation and decommissioning.
- Alien plant material removed during construction and eradication efforts should be contained and disposed of properly to limit accidental spread.
- Construction activities must be limited to the smallest possible area.
- Construction vehicles will use existing authorized service roads (where possible).
- Ongoing alien vegetation removal should take place in and around the development footprint.

9.2. Destruction of indigenous vegetation and habitat

The vegetation present on site it is not representative of the Bloemfontein Dry Grassland vegetation type as defined in the vegetation map, Figure 5 and is disturbed. However, some to most of the vegetation occurring on site will be lost/cleared during the construction of the proposed township development. In this case the following mitigation efforts should be implemented:

Mitigation:

- No construction personnel are allowed to collect, harvest or destroy any species of flora on or off the site, unless specifically earmarked for removal.
- The construction activities should be confined within the development footprint and avoid disturbing areas beyond the borders of the development footprint.

- No surrounding intact indigenous vegetation should be disturbed.
- All disturbed and compacted soils need to be ripped, reprofiled and reseeded and/or replanted with indigenous species, in cases of rehabilitation purposes.
- Vehicles should be restricted to travelling only on designated roadways to limit the ecological footprint of the proposed development activities.

9.3. Damage to sensitive habitats

The construction footprint is proposed to take place within the wetland areas as found on site. Except for the three identified areas, no other sensitive watercourse habitats were identified on site. No other impacts on sensitive habitats are anticipated at this point as hydrology in this area has been changed. Possibilities of other impacts may include pollution of water courses downstream as a river is located approximately 700 metres from the proposed area, flowing through the already developed township area. Pollution sources may include hazardous chemicals, waste (litter) and materials entering water runoff. Drainage lines are however present and can be seen in Figure 8. It is therefore recommended that a thorough wetland delineation and Risk Assessment study be conducted on the site to determine the proposed impact on these systems.

Mitigation:

- Water drainage should be properly planned and addressed to drain water from the site and prevent any accumulation on site.
- Stormwater management should maintain the natural flow regime as far as possible.
- Sewage should be handled in the correct manner in order to prevent leakages into any natural watercourse area.
- Proper waste management during all phases of the activity, as well as storm water management, will have to be strictly enforced and monitored. This is to prevent any litter, rubble or possible pollution to enter any watercourses downstream of the site and the surrounding environment in general.

9.4. Disturbance to fauna

The construction of the facility will result in some habitat loss for any resident fauna that may be present. Few signs of animals were observed during the site visit. Fauna observed during the site visit was *Suricata suricatta* and cattle grazing in the area. If any animals, especially burrowing animals are encountered on site, they should be removed by a trained and qualified person. Permits should be applied for should translocation of protected species take place. In addition, increased levels of noise, pollution, disturbance and human presence during construction will be detrimental to resident fauna. Sensitive and shy fauna may move away from the area during the construction phase as a result of the

noise and human activities. During the operational phase (established township), interactions between the infrastructure considered here and fauna are likely to be low. Fauna will most likely avoid the area by moving around the proposed infrastructure. With a large increased human activity as soon as the construction starts it is anticipated that fauna will move away from the proposed footprint area.

Mitigation:

- No construction personnel are allowed to collect, harvest or kill any species of fauna on the site.
- Holes and trenches should not be left open for extended periods of time and should only be dug when immediately needed. Trenches left open for some days, should have escape ramps present at regular intervals to allow any fauna that fall in to escape.
- Keep the facility neat, tidy and clean.
- It is expected that any small mammals that occurred on the property before construction commenced would have moved from the area. Should any animals return to the property once the township is in operation, care should be taken not to disturb any animals.
- It must be ensured that no alien invasive animals or birds are introduced into the area. Should any accidental introductions occur, the species must be controlled in the correct environmentally friendly manner.
- Keep the facility neat, tidy and clean in order not to attract scavenging animals such as rats and mice.

9.5. Soil Erosion:

Areas within and around the project footprint could potentially be prone to surface soil erosion, but the soil has a relatively low erosion potential. In the current degraded state, the proposed area are relatively bare while some patches are bare and therefore the risk is relatively low considering the slope and soil erodibility. No signs of erosion were found on site.

Mitigation:

- Implement suitable erosion prevention measures during the construction, operation and decommissioning phase.
- Make use of surface erosion measures within disturbed areas to avoid erosion in times of high risk (e.g. rain season and time of high wind speeds).
- Stormwater management along any roadways and paths to reduce gulley erosion formation.
- Stormwater management should prevent excessive sediment to be carried into any watercourses.
- Soil disturbance must be kept to a minimum within and around the development footprint.

- Freedom of surface water drainage through placing culvert drains beneath the roadway in a way that disperses the water over the entire width of the area will reduce the impacts of erosion through limiting water velocities and the scouring potential associated to high-velocity water.
- Correct site reinstatement and landscaping following any disturbances will abate channel and gulley formation.
- Removal of debris and other obstructing materials from the site must take place and erosion preventing structures must be constructed. This is done to prevent damming of water and increasing flooding danger.
- Soil erosion must be controlled as an ongoing management strategy throughout the various phases of the proposed development activities.
- Disturbed areas, that will not form part of the operational footprint but which were disturbed as part of the construction activities, should be rehabilitated and re-vegetated using site-appropriate indigenous vegetation and/or seed mixes.
- Sheet runoff from cleared areas, paved surfaces and access roads needs to be curtailed; such as planting grass or capturing water in stormwater channels and slowing it down in retention ponds or increasing surface roughness.
- Point-source discharges (such as road drains) should be dispersed to avoid the formation of gullies.
- Point-source discharges, such as road drains, cause gullies and should be dispersed by using attenuation ponds.

9.6. Dust generation and emissions

The current bare soil of the project area could potentially result in dust emissions. Dust could spread into the surrounding areas. The significance of this potential impact will likely however be medium to high and should be monitored. Emissions from the proposed township development are unlikely to take place, but if present it can have an impact on local wildlife in surrounding areas and the ecosystem if not properly monitored. This impact, if present, will have to be included in the EIA application.

Mitigation:

- Implement suitable dust management and prevention measures during the construction phase.
- Areas around the project footprint must be adequately rehabilitated to prevent significant dust emissions.
- It is recommended that all bare soil, after construction activities, be planted with indigenous grass where possible.
- All regulations should be strictly followed in terms of emission regulations.

9.7. Water quality and quantity

The area is at relatively low risk of groundwater pollution. It is anticipated that municipal water will be used. If borehole water will be used the quality must be sampled quarterly (or as deemed fit by a water specialist) and surface water quality be evaluated annually (or as surface water is available) up and downstream of the property, as pollution from the proposed site may affect the downstream river in the already existing township.

Mitigation:

- Provision of adequate on-site sewerage management.
- Appoint water specialist to monitor groundwater usage and water quality, as well as surface water (if applicable).
- Sewerage and sanitation facilities should be regularly maintained and checked.
- Sufficient waste receptacles should be placed around the development in order to encourage people to use them.
- The principle of reduce, re-use and recycle should be followed.
- Site should be kept clean and tidy during all phases of activity.
- Any waste should be disposed in a registered landfall and not be allowed to be dumped in the surrounding landscape.
- All surfaces used for waste storage and loading areas should have an impermeable surface.
- Avoid the use of concrete lined channels for storm water management as this can increase the speed of water. This in turn increases erosion potential that can cause erosion on site and in channels and increase siltation downstream. If concrete-lined channels are used; they should end in silt traps.
- Structures must be inspected regularly for the accumulation of debris, blockages, instabilities and erosion with concomitant remedial and maintenance actions.
- Regular inspections will be undertaken of any access roads and stormwater management drains for signs of erosion and sedimentation.
- Regularly inspect all vehicles for leaks (during construction). Re-fueling of vehicles (if any) must take place on a sealed surface area surrounded by berms to prevent ingress of hydrocarbons into topsoil.
- No dumping of waste or any other materials is allowed within any stormwater channel or watercourses.
- If any spills occur, they should be immediately cleaned up.
- Stormwater and run-off should be managed and diverted to not be in contact with waste.

- No dirty water runoff from the construction, operational and decommissioning site must be permitted to reach any watercourse.
- Spill kits must be stored on site: In case of accidental spills of oil, petroleum products etc., good oil absorbent materials must be on hand to allow for the quick remediation of the spill. The kits should also be well marked and all personnel should be educated to deal with the spill. Vehicles must be kept in good working order and leaks must be fixed immediately on an oil absorbent mat. The use of a product such as Sunsorb is advised.
- Removed soil and stockpiling of soil must occur outside the extent of watercourses, stormwater channels and water affected areas to prevent siltation and increased runoff.
- Proper toilet facilities must be available during the operational and decommissioning phase. The impact of human waste on the system is immense. Chemical toilets must be provided during construction and should always be well serviced and spaced as per occupational health and safety laws, and placed outside the 1:100 year flood lines.

9.8. Surface- and groundwater contamination

If any organic waste or contaminated waste water enter surface-or ground water it can lead to nutrient build-up in the water with negative impacts on the water quality and the aquatic ecosystem (Gerber et. al, 2007).

Mitigation measures to reduce potential impacts:

- Proposed township and adjacent area should be kept clean and tidy.
- Any waste should be disposed in a registered landfall and not be allowed to be dumped in the surrounding landscape.
- All waste handling or storage surfaces in the facility should have an impermeable surface.
- Storm water and run-off should be managed and diverted to not be in contact with waste.

9.9. Positive impact of rehabilitating development footprint

Once the operation is decommissioned a positive impact on the environment is possible if the site is suitably rehabilitated and restored to host a structure, composition and ecological functioning similar to the applicable vegetation type. It should be noted that the development is not planned to be decommissioned, however, the areas possible for rehabilitation and landscaping should be rehabilitated accordingly.

Mitigation:

- On completion of a section of works, the area must be rehabilitated by suitable landscaping, levelling, topsoil dressing, land preparation, alien plant eradication and where ascribed for by the ECO, vegetation establishment (where needed);
- Clear and completely remove from site all construction structures and temporary infrastructure;
- All permanent infrastructure must be returned to a useable state;
- Remove all inert waste and rubble, such as excess rock, any structural foundations and remaining aggregates. Only once this material has been removed, the site shall be re-instated and rehabilitated;
- The reinstatement of disturbed areas must follow immediately after the removal of structures and temporary infrastructure;
- Topsoil backfilling must be undertaken when the soil is dry, and not following any recent rainfall events;
- The replacement of topsoil should be sought in situ with construction where possible, or as soon as construction in an area has been completed;
- Topsoil must be returned to the same site from where it was stripped;
- When insufficient topsoil remains, soil of a similar quality can be obtained from a nearby area within the construction area which was disturbed;
- Once topsoil has been returned to the ground, stripped vegetation should be randomly spread over the area;
- All re-growth of invasive vegetative material will be monitored by the Developer for one year;
- All areas under rehabilitation are to be treated as no-go areas using danger tape and steel droppers/fencing and cordoned off, to prevent vehicular, pedestrian and livestock access;
- A systematic rehabilitation programme must be undertaken to restore the development footprint to its condition prior to the commencement of the activity;
- All areas of disturbed and compacted soils need to be ripped, reprofiled and reseeded and/or replanted with indigenous species;
- Active alien invasive plant control measures must be implemented to prevent invasion by exotic and alien vegetation within the disturbed area;
- Rehabilitation structures must be inspected regularly for the accumulation of debris, blockages, instabilities and erosion with concomitant remedial and maintenance actions.

9.10. Waste handling and pollution prevention

Proper waste management during construction and operation, as well as storm water management, should be strictly enforced and monitored.

- Provide adequate waste bins on-site equipped with a lid to ensure no pollution;
- General waste must be collected in containers disposed of weekly at the nearest permitted Municipal landfill site;
- Recyclable waste must be recovered for recycling purposes;
- Scrap metals and materials should be stored in a stockpile on an impervious surface where water from rain, sprinklers or surface drainage cannot be in contact with it;
- All domestic waste is to be removed from site and disposed of at a registered solid waste landfill site; as to be mentioned in the EIA Report;
- Hazardous waste quantities my not exceed the thresholds as prescribed in the National Environmental Management: Waste Act, List of Waste Management Activities that have, or are likely to have, a Detrimental Effect on the Environment, GN 921 in Government Gazette 37083 dated 29 November 2013. Commencement date: 29 November 2013 (Repealed GN 718);
- All hazardous substances must be stored on an impermeable surface and away from any stormwater drainage; and,
- Storm water handling must be done in order to prevent erosion.

9.11. Cumulative Impact Assessment

The area is disturbed by previous activities on the proposed site. The proposed project will not fragment habitats, and is located within an urban area adjacent to existing townships. In relation to the existing landscape transformation, the negative impact that the project will cumulatively add to habitat preservation or ecological functionality persistence of the broader area will be low.

10.Risk Ratings of Potential Impact Assessment

The following section provides the Environmental Risk as well as the Environmental Significance Ratings for the potential ecological impacts for the proposed project both before and after implementation of the recommended mitigation measures.

Table 8 – Risk ratings and potential Impact Assessment.

Project alternative	Potential environ-mental impact/ Nature of impact	Environmental significance																	
		Before mitigation									After mitigation								
		Magnitude	Duration	Extent	Irreplaceability	Reversibility	Probability	Total (SP)	Significances	Cumulative	Magnitude	Duration	Extent	Irreplaceability	Reversibility	Probability	Total (SP)	Significance	Cumulative
Project activity	Construction phase																		
Proposed Township development	Spread and establishment of alien invasive species	6	4	1	2	2	4	**60**	Medium	Low	2	3	1	0	1	2	**14**	Low	Low
	Waste handling and pollution prevention	6	3	2	2	2	3	**45**	Medium		4	2	2	2	1	2	**22**	Low	Low
	Destruction of indigenous vegetation and habitat	2	2	1	2	2	3	**27**	Low	Low	2	2	1	1	1	2	**14**	Low	Low
	Disturbance to fauna	4	4	2	2	2	2	**28**	Low	Low	2	3	1	1	2	1	**9**	Low	Low
	Damage to sensitive habitats	4	3	2	3	3	2	**30**	Low	Low	2	2	1	1	2	1	**8**	Low	Low
	Soil erosion	4	3	2	2	2	3	**39**	Low	Low	2	2	1	1	2	2	**16**	Low	Low
	Water quality and quantity	6	3	2	3	2	3	**48**	Medium	Low	2	2	2	2	2	1	**10**	Low	Low
	Surface and groundwater contamination	4	3	3	2	3	2	**30**	Low	Low	2	3	2	2	2	1	**11**	Low	Low
	Dust generation and emissions	6	2	2	2	4	4	**64**	Medium	Low	2	1	1	1	2	3	**21**	Low	Low

Project alternative	Potential environ-mental impact/ Nature of impact	Environmental significance																	
		Before mitigation									After mitigation								
		Magnitude	Duration	Extent	Irreplaceability	Reversibility	Probability	Total (SP)	Significances	Cumulative	Magnitude	Duration	Extent	Irreplaceability	Reversibility	Probability	Total (SP)	Significance	Cumulative
	Operational phase																		
	Soil erosion	4	3	1	1	2	3	**33**	Low	Low	2	2	1	1	2	2	**16**	Low	Low
	Waste handling and pollution prevention	4	3	3	2	2	3	**42**	Medium	Low	2	2	1	1	2	2	**16**	Low	Low
	Spread and establishment of alien invasive species	4	4	1	2	2	3	**39**	Low	Low	0	1	1	0	0	1	**2**	Low	Low
	Destruction of indigenous vegetation and habitat	2	2	1	1	1	3	**21**	Low	Low	2	1	1	1	1	2	**12**	Low	Low
	Damage to sensitive habitats	4	3	2	2	2	9	**39**	Low	Low	2	2	2	2	1	1	**9**	Low	Low
	Disturbance to fauna	4	2	2	2	2	2	**24**	Low	Low	2	2	2	2	1	1	**9**	Low	Low
	Dust generation and emissions	6	2	3	3	3	3	**51**	Medium	Low	4	1	2	2	2	2	**22**	Low	Low
	Water quality and quantity	6	3	3	2	3	2	**34**	Low	Low	2	3	2	2	2	2	**22**	Low	Low
	Surface and groundwater contamination	4	3	3	2	2	2	**28**	Low	Low	2	2	2	1	1	1	**8**	Low	Low

Project alternative	Potential environ-mental impact/ Nature of impact	Environmental significance																	
		Before mitigation									After mitigation								
		Magnitude	Duration	Extent	Irreplaceability	Reversibility	Probability	Total (SP)	Significances	Cumulative	Magnitude	Duration	Extent	Irreplaceability	Reversibility	Probability	Total (SP)	Significance	Cumulative
	Decommission phase																		
	Soil erosion	4	3	2	2	2	3	**39**	Low	Low	2	2	1	1	2	2	**16**	Low	Low
	Spread and establishment of alien invasive species	4	4	1	2	2	3	**39**	Low	Low	0	1	1	0	0	1	**2**	Low	Low
	Disturbance to fauna	4	3	1	1	2	2	**22**	Low	Low	2	2	1	1	2	1	**8**	Low	Low
	Destruction of indigenous vegetation and habitat	2	3	1	1	1	3	**24**	Low	Low	2	2	1	1	1	1	**7**	Low	Low
	Damage to sensitive habitats	4	3	1	2	2	2	**24**	Low	Low	0	1	0	0	1	1	**2**	Low	Low
	Dust generation and emissions	4	1	2	2	3	3	**36**	Low	Low	2	1	1	1	3	2	**16**	Low	Low
	Water quality and quantity	4	3	2	2	2	2	**26**	Low	Low	2	2	2	2	1	1	**9**	Low	Low
	Surface and groundwater contamination	4	3	2	2	2	2	**26**	Low	Low	2	2	2	2	1	1	**9**	Low	Low
	Waste handling and pollution prevention	4	3	3	2	2	3	**42**	Medium	Medium	4	2	2	1	1	2	**20**	Low	Low

Project alternative	Potential environ-mental impact/ Nature of impact	Environmental significance																	
		Before mitigation									After mitigation								
		Magnitude	Duration	Extent	Irreplaceability	Reversibility	Probability	Total (SP)	Significances	Cumulative	Magnitude	Duration	Extent	Irreplaceability	Reversibility	Probability	Total (SP)	Significance	Cumulative
	Positive impact of rehabilitating development footprint	4	4	2	0	2	3	**36 (+)**	Low	Low	-	-	-	-	-	-	NA	NA	NA

11. Monitoring

- The contractor appointed for construction must be contractually bound to the requirements and mitigating measures listed in this document and any other documents relating to the construction (ecological management plan, rehabilitation plan, other specialist studies done etc.). It should be insured that monitoring is done on waste and pollution control.
- An Environmental Control Officer (ECO) must be appointed to ensure compliance with the requirements during the construction- and decommission phase.
- An Ecological Management Plan (EcoMP) for the site should be compiled to address: Alien vegetation control and monitoring and Erosion monitoring and control. As the impact seems to be low, this may however just be a method statement for the constractor during the construction phase.
- Frequent inspection of the site must be done to ensure that no harmful practices occur.
- A photo collection must be taken from fixed demarcated spots to detect changes in the construction area over time. These photographs must be dated and should include the entire site.
- Regular inspection of erosion preventing devices is needed and any new erosion gullies must be remediated immediately.
- Access routes should be demarcated and located properly so that no damage to the system can occur. These roads must be adhered to at all times.
- Storm water leaving the site downstream must be clean and of the same quality as in situ before it enters the construction site (upstream). Preconstruction measures must be in place to ensure sediments are trapped.

- The risk of contamination is however low in this environment provided that chemical spills and oil leaks are closely monitored during construction and decommissioning phases.
- Stormwater management should be closely monitored and any water diversions around construction site and development should be inspected for signs of erosion and sedimentation.
- The flow paths will periodically need to be desilted to ensure that the flow depth is maintained and large vegetation growth removed to prevent the flow paths from becoming blocked.
- Copies of all designs, method statements, risk assessments, rehabilitation plans and any other reports required must be stored and made available to the responsible authorities on request.

12. Recommendations

The proposed area has been subjected to degradation and destruction while alien invasive species establishment took place. There are several pioneer, indigenous, herbaceous, weedy, trees and alien invasive species found in the footprint area. The alien invasive species will spread and re-emerge continually if not controlled and removed in a proper manner.

Although relatively flat, a slight slope is present which may cause water accumulating on site, as found in one natural wetland and two artificial wetland areas. The water accumulates in the artificial wetland areas because of manmade dam walls present at these areas (Appendix 2). Slopes in different directions are present while the netto slope leads to the river situated roughly 700m from artificial watercourse 1. It is advised with construction of the proposed township development that a stormwater management plan and draining should be implemented to properly drain run-off water. A thorough Wetland Delineation study as well as a Risk Matrix must be considered in order to determine if downstream water courses may be effected by any possible pollution that occurs on site and to determine to what extent wetland areas will be influenced. In this study it should be determined what the present ecological status (PES), Ecological Importance and Sensitivity (EIS) and contribution to ecological are. Management measures should be recommended in order to mitigate the effect of construction on these sensitive areas as thorough as possible.

There are various plant species found in the footprint area. Of these species, none was found to be of conservation concern (red data species). It is unlikely that any species of conservation concern will occur on site. Regardless, it is still suggested that a botanical walkthrough be conducted before construction commences, to detect any flowering species that might have been missed before.

13. Conclusion

The site currently contributes relatively low value to the ecological functioning of the area due to the degraded state of the site. The overall footprint of the proposed facility is not likely to generate a significant impact on broad scale ecological processes or landscape connectivity, on condition that all mitigation measures are followed. The latter is due to the surrounding and past activities that resulted in degradation of the site area. If mitigation measures are implemented, the likelihood of significant ecological impacts occurring on the ecosystem will be reduced to low levels. Any risk of pollution due to inappropriate disposal of waste and litter must be mitigated to an acceptable level through the appropriate waste management and ensuring that no runoff or contaminated effluent from the construction site or development enters the environment. No important species (fauna and flora) of conservation concern was found during the site visit. It is also unlikely for any endangered or red list species to occur on the site area. Because of the degradation present on the site and surrounding areas, most of the fauna already moved away.

Overall, the impacts associated with the development are likely to be mainly low to medium and there are no anticipated impacts of high significance. All the impacts can however, be mitigated to low levels. Consequently, it is suggested that the proposed project to continue, if all recommended mitigation measures as per this ecological report and further specialist studies are adequately implemented and managed during the construction phase, operational- and decommission phases of the proposed project. All necessary authorisations and permits must also be obtained prior to any commencement.

Based on this report no significant impacts on the ecology on the proposed construction area was anticipated, and construction can therefore take place from an ecological perspective.

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15.Appendix 1 – Photos of the proposed site

Figure A1.1 - Northern view of the proposed site

Figure A1.2 – North western view of the proposed site

Figure A1.3 - Western view of the proposed site

Figure A1.4 – South western view of the proposed site

Figure A1.5 - Southern view of the proposed site

Figure A1.6 – South eastern view of the proposed site

Figure A1.7 - Eastern view of the proposed site

Figure A1.8 – North eastern view of the proposed site

16.Appendix 2 – Wetland-and degraded areas as found on site

Figure A2.1 - Wetland area #1 as found on proposed site

Figure A2.2 - Wetland area #1 as found on proposed site

Figure A2.3 - Wetland area #1 as found on proposed site

Figure A2.4 - Wetland area #1 as found on proposed site

Figure A2.5 - Wetland area #2 (artificial watercourse 1) as found on proposed site

Figure A2.6 - Wetland area #2 (artificial watercourse 1) as found on proposed site

Figure A2.7 - Wetland area #2 (artificial watercourse 1) as found on proposed site

Figure A2.8 - Wetland area #2 (artificial watercourse 1) as found on proposed site

Figure A2.9 - Wetland area #3 (Artificial watercourse 2) as found on proposed site

Figure A2.10 - Wetland area #3 (Artificial watercourse 2) as found on proposed site

Figure A2.11 - Wetland area #3 (Artificial watercourse 2) as found on proposed site

Figure A2.12 – Illegal dumping area as found on the proposed site

Figure A2.13 - Degraded area as found on proposed site

Figure A2.14 - Degraded area as found on proposed site

Figure A2.15 - Degraded area as found on proposed site

APPENDIX D1.1: WETLAND ASSESSMENT REPORT

WETLAND IMPACT ASSESSMENT FOR THE PROPOSED TOWNSHIP ON A PORTION OF THE FARM KLIPFONTEIN 716 AND FARM CERES 626 WITHIN MANGAUNG METROPOLITAN MUNICIPALITY, FREE STATE PROVINCE

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Reference	KLP/CRC	
Submitted To	NGOTI DEVELOPMENT CONSULTANTS	
Authors	Mokgatla Molepo *Pr. Nat. Sci* (009509)	

EXECUTIVE SUMMARY

MORA Ecological Services (Pty) Ltd was appointed to conduct a wetland impact assessment for the proposed township establishment on portion of the Farm Klipfontein and Farm Ceres 626, within Mangaung Metropolitan Municipality, Free State Province.

A site visit was undertaken on the 21st of June 2020 by the professional team. Aquatic features which occur within the study area consist of a natural depression wetland and two artificial wetlands.

This wetland assessment report is intended to provide detailed information on the aquatic constraints, potential impacts and recommended mitigation measures for the proposed project.

The proposed residential township establishment is likely to significantly alter only the artificial wetland located within the site boundary. The wetlands and their immediate surroundings should be protected during construction and operational phase of the proposed project. These wetlands are used as drinking holes by livestock belonging to the surrounding communities.

In line with the above, the risk of the proposed activities resulting in any degradation of the aquatic ecosystems in the study area is low.

The Risk Assessment for the proposed project as per the General Authorisation in terms of Section 39 of the National Water Act, 1998 (Act No. 36 of 1998) for Water Uses as defined in Section 21 (c) and (i) (Notice 509 of 2016) was undertaken.

Due to the limited ecosystem goods and services provided by the wetlands, all potential impacts on these waterbodies received Low Risk Scores. The proposed township establishment will therefore not result in the net loss of natural wetlands within the catchment, and it is the recommendation of the specialist that the project be considered.

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DECLARATION OF INDEPENDENCE

I, Mokgatla Molepo, in my capacity as a specialist consultant, hereby declare that I:

- Act/acted as an independent specialist to NGOTI Development Consultants for this project.
- Do not have any personal, business or financial interest in the project expect for financial remuneration for specialist investigations completed in a professional capacity as specified by the Environmental Impact Assessment Regulations, 2017.
- Will not be affected by the outcome of the environmental process, of which this report forms part of.
- Do not have any influence over the decisions made by the governing authorities.
- Do not object to or endorse the proposed developments but aim to present facts and my best scientific and professional opinion with regard to the impacts of the development.
- Undertake to disclose to the relevant authorities any information that has or may have the potential to influence its decision or the objectivity of any report, plan or document required in terms of the Environmental Impact Assessment Regulations, 2017.

INDEMNITY

- This report is based on survey and assessment techniques which are limited by time and budgetary constraints relevant to the type and level of investigation undertaken.
- This report is based on a desktop investigation using available information and data related to the site to be affected, *in situ* fieldwork, surveys and assessments and the specialists best scientific and professional knowledge.
- The Precautionary Principle has been applied throughout this investigation.
- The findings, results, observations, conclusions and recommendations given in this report are based on the specialist's best scientific and professional knowledge as well as information available at the time of study.
- Additional information may become known or available during a later stage of the process for which no allowance could have been made at the time of this report.
- The specialist reserves the right to modify this report, recommendations and conclusions at any stage should additional information become available.
- Information and recommendations in this report cannot be applied to any other area without proper investigation.
- This report, in its entirety or any portion thereof, may not be altered in any manner or form or for any purpose without the specific and written consent of the specialist as specified above.
- Acceptance of this report, in any physical or digital form, serves to confirm acknowledgement of these terms and liabilities.

Mokgatla Molepo *Pr. Nat. Sci.* (009509)

22 June 2020

1. INTRODUCTION

Wetlands are defined as those areas that have water on the surface or within the root zone for long periods during the year to allow for the development of anaerobic conditions. In terms of Section 1 of the National Water Act (NWA, Act 36 of 1998), wetlands are legally defined as: (1) land which is transitional between terrestrial and aquatic systems where the water table is usually at or near the surface, or the land is periodically covered with shallow water, and which land in normal circumstances supports or would support vegetation typically adapted to life in saturated soil.

Whereas, RAMSAR Convention defines wetland as: (1.1) areas of marsh, fen, peatland or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed six meters.

And (2.1) may incorporate riparian and coastal zones adjacent to the wetlands, and islands or bodies of marine water deeper than six meters at low tide lying within the wetlands.

Wetlands are created from anaerobic conditions formed by unique soil conditions (i.e. hydric soils) and support vegetation (i.e. hydrophytes) that are adapted to these conditions. The hydric soils develop a grey or sometimes greenish or blue-grey colour as a result of the chemical reduction of iron (i.e. gleying). The hydric soils that are seasonally flooded are characterized by the formation of mottles, which are relatively insoluble, enabling them to remain in the soil long after it has been drained.

As a result, it is possible to identify wetland areas on the basis of soil colour using a standard colour chart such as Munsell Soil Colour Chart, 1994 to determine matrix hue and chroma levels. The mottle hue and chroma initially increase and then decrease the more saturated the soils are which helps to ascertain if the area is a wetland or not and the period of saturation.

Typically, indicators of soil wetness based on soil morphology correspond closely with vegetation distribution, since hydrology affects soils and vegetation in systematic and predictable ways. In systems where the hydrological regime has been modified due to human activities, vegetation distribution will vary systematically with soil morphology. The response of vegetation to alteration of hydrological conditions is rapid (i.e. months/years), whereas the response of soil morphology to such alteration is slow (i.e. centuries). Therefore, lowering of the water table or reduction of surface flows, may lead to rapid establishment of non-wetland related terrestrial vegetation, whereas the soil morphology will retain indicators of wetness for a lengthy period.

Soil morphology forms the basis of wetland delineation nationally, mainly because it provides a long-term indication of the “natural” hydrological regime. However, soil

morphology cannot be considered to necessarily reflect the current hydrological conditions of the site where the hydrological regime has been altered, and in such circumstances, vegetation provides the best indication of the distribution of wetlands as it best reflects current hydrological conditions.

MORA Ecological Services (Pty) Ltd was appointed to conduct a wetland impact assessment for the proposed township establishment on portion of the Farm Klipfontein and Farm Ceres 626, within Mangaung Metropolitan Municipality, Free State Province.

A site visit was undertaken on the 21st of June 2020 by the professional team. Aquatic features which occur within the study area consist of a natural depression wetland and two artificial wetlands used for livestock drinking holes.

This wetland assessment report is intended to provide detailed information on the aquatic constraints, potential impacts and recommended mitigation measures for the proposed project.

1.1. PROJECT LOCATION

The proposed project area is located south east of Bloemfontein City (Figure 1).

The following are the central coordinates of the site:

29°13'21"S

26°15'39"E

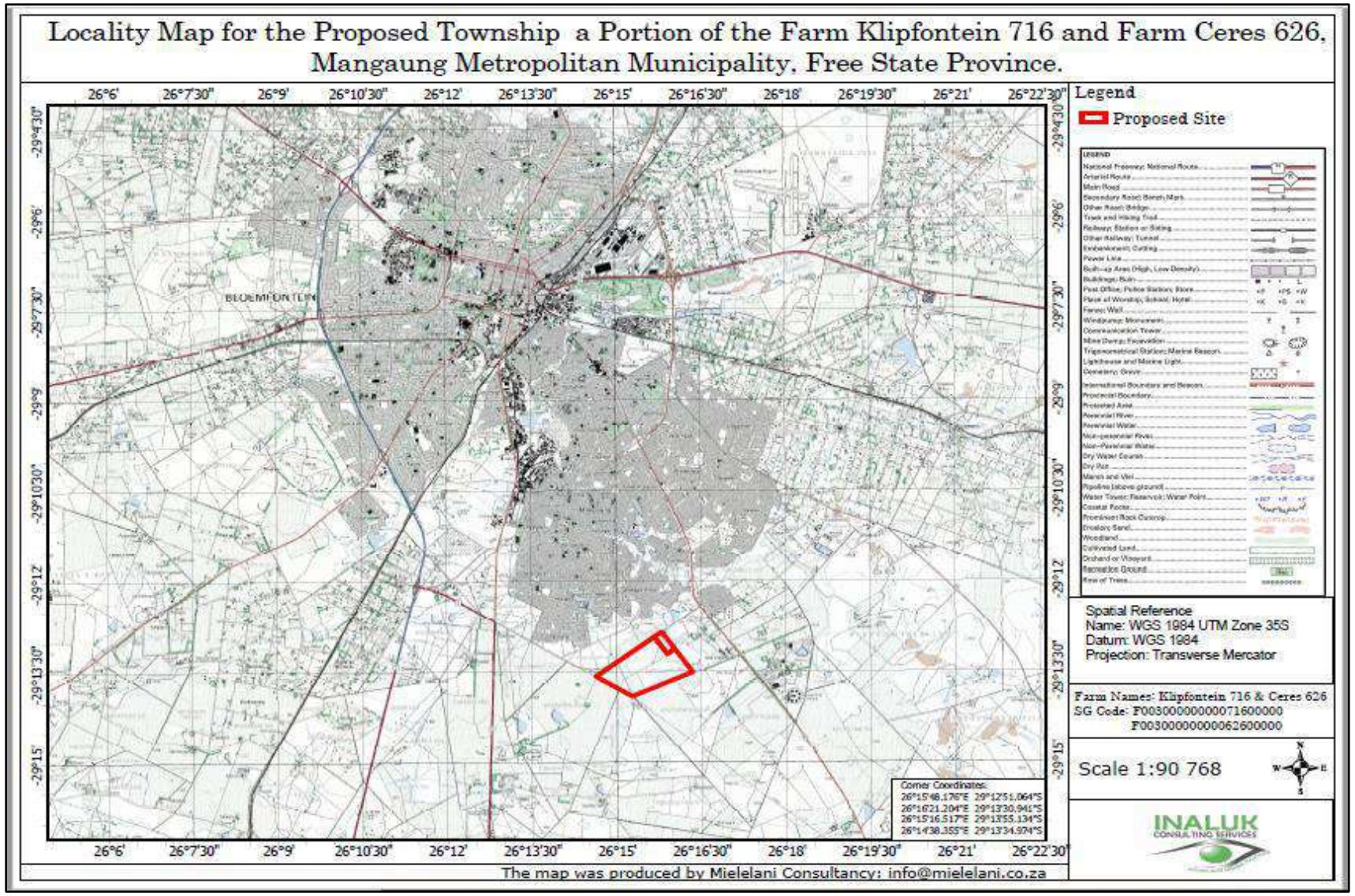


Figure 1: Locality map of the project area.

2. TERMS OF REFERENCE

The terms of reference for this study were as follows:

- Identify, assess, and delineate any waterbodies/wetlands within the study area;
- Identify and apply buffers to the outer edges of the wetlands within the site;
- Assess impacts of the proposed township establishment and suggest mitigation measures for minimising potential impacts on wetlands; and
- Compile report with maps.

3. METHODOLOGY

Input into this report was informed by a combination of desktop assessments of existing aquatic ecosystem information for the study area and catchment, as well as by a more detailed assessment of the aquatic features on the site. The site was visited in June 2020. During the field visit, the characterisation and integrity assessments of the aquatic features and the site were undertaken. The SANBI Biodiversity GIS website was also consulted to identify any constraints in terms of fine-scale biodiversity conservation mapping as well as possible aquatic features mapped in the Freshwater Ecosystem Priority Areas maps.

The level of this assessment conducted was considered to be adequate for this project. This assessment was undertaken as a requirement in terms of National Environmental Management Act 107 of 1998 which manages and conserves natural resources; thus monitors and assess their sustainable use and compliance and the Environmental Impact Assessment Regulations of 2017 which indicates the listed activities that pose environmental threats anticipated during proposed development in order to attain sustainable environmental management and economic development prior to authorization.

3.1. WETLAND DEFINITION AND DELINEATION TECHNIQUE

For the purpose of this assessment, wetlands are considered as those ecosystems defined by the National Water Act as:

"land which is transitional between terrestrial and aquatic

systems where the water table is usually at or near the surface,

or the land is periodically covered with shallow water, and

which land in normal circumstances supports or would support

vegetation typically adapted to life in saturated soil."

These habitats are found where the topography and geological parameters impede the flow of water through the catchment, resulting in the soil profiles of these habitats becoming temporarily, seasonally or permanently wet. Further to this, wetlands occur in areas where groundwater discharges to the surface forming seeps and springs. Soil wetness and vegetation indicators change as the gradient of wetness changes (Fig. 2)

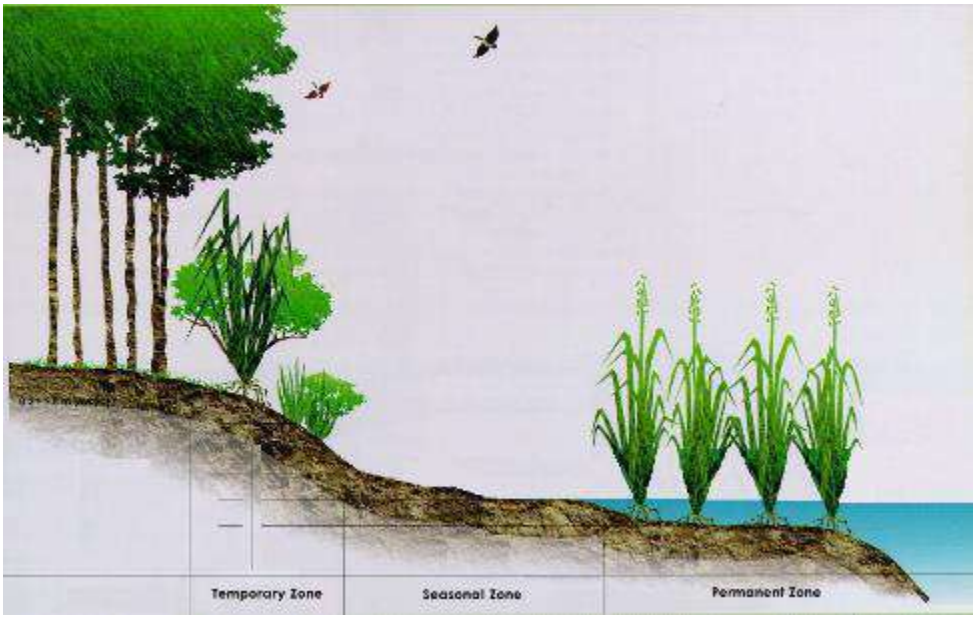


Figure 2: Increasing soil wetness zones.

Based on the definition of a wetland within the National Water Act, three vital concepts govern the presence of a wetland namely:

i. Hydrology- Land inundated by water or which displays saturated soils when these soils are biologically active (the growth season).
ii. Hydric soils- Soils that have been depleted of oxygen through reduction resulting in the presence of redoximorphic features.
iii. Hydrophytic vegetation- Plant species that are adapted to growing in saturated soils and subsequent anaerobic conditions (hydrophytes).

The conservation of wetland systems is vital as these habitats provide numerous functions that benefit not only biodiversity but provide an array of ecosystem services. These services are further divided into direct and indirect and are detailed in Table 1.

Table 1: Direct and indirect benefits of wetland systems (Kotze et al. 2005).

WETLANDS GOODS AND SERVICES	
DIRECT	**INDIRECT**
Hydrological Water purification Flood reduction Erosion control Groundwater discharge	*Socio-economic* Socio-cultural significance Tourism and recreation Education and Research
Biodiversity conservation	Water supply
Chemical cycling	Provision of harvestable resources

The study site was assessed with regards to the determination of the presence of wetland areas according to the procedure described in 'A Practical Field Procedure for Identification and Delineation of Wetland and Riparian Areas – Edition 1' (DWAF, 2005).

3.2. WETLAND HEALTH AND FUNCTIONAL INTEGRITY ASSESSMENT TECHNIQUES

Out of the three wetlands found around the study site, only one is natural, but located at a significant distance from the development. A level 2 Wet-Health Assessment was used to determine the Present Ecological State (PES); a Level 2 Wet-EcoServices Assessment, and an Ecological Importance and Sensitivity (EIS) assessment of these wetlands was carried out. This was to understand if the artificial wetlands provide any ecological goods and services and/or contribute to conservation targets within the larger catchment.

3.3. ASSESSMENT OF IMPACT SIGNIFICANCE

Significance scoring both assesses and predicts the significance of environmental impacts through evaluation of the following factors; probability of the impact; duration of the impact; extent of the impact; and magnitude of the impact. The significance of environmental impacts is then assessed considering any proposed mitigations. The significance of the impact "without mitigation" is the prime determinant of the nature and degree of mitigation required. Each of the above impact factors have been used to assess each potential impact using ranking scales (see Table 2).

Table 2: Significance scoring used for each potential impact.

PROBABILITY	DURATION
1-very improbable 2-improbable 3-probable 4-high probable 5-definite	1- very short duration (0-1years) 2- short duration (2-5 years) 3- medium term (5-15 years) 4- long term (>15 years) 5- permanent/unknown
EXTEND	**MAGNITUDE**
1- Limited to the site 2- Limited to the local area 3-Limited to the region 4-National 5-International	2- minor 4- low 6-moderate 8-high 10-very high

The following formula was used to calculate impact significance: Impact Significance: (Magnitude + Duration + Extent) x Probability

The formula gives a maximum value of 100 points which are translated into 1 of 3 impact significance categories; Low, Moderate and High as per Table 3.

Table 3: Impact significance ratings

SIGNIFICANCE POINTS	SIGNIFICANCE RATING
0 - 30 points	Low environmental significance
31 - 59 points	Moderate environmental significance
60 -100 points	High environmental significance

4. DESCRIPTION OF THE STUDY AREA

The area has been exposed to some levels of disturbance such as historic farming, illegal dumping, alien invasion, trampling and grazing by livestock. It is currently an open space.

Figure 3: Artificial wetland located on the north eastern side of the study site (Wetland 2).

Figure 4: Natural depression wetland located west of the study site (Wetland 1).

Figure 5: Artificial wetland located east, outside the boundary of the study site (Wetland 3).

4.1.1. Climate

The climate here is classified as BSk (local steppe) by the Köppen-Geiger system. The area falls under the summer-rainfall region. The average annual temperature around within the region is 15.7 °C. In a year, the rainfall is 450 mm.

4.1.2. Vegetation

Figure 6: Typical vegetation of the site.

The study area falls within the Grassland Biome. The natural vegetation type found in the area is Bloemfontein Dry Grassland (Fig. 7). This vegetation type is found in Free State Province: South-central part of the province, with Bloemfontein more or less centrally. Extending from Petrusburg in the west to the Rustfontein Dam in the east and from Reddersburg in the south to the Soetdoring Nature Reserve in the north It occurs on a varying altitude ranging between 1200 -1480 m a.s.l (Bredenkamp & van Rooyen, 1996; Mucina & Rutherford, 2006).

Geology & Soils

Sedimentary mudstones and layers of sandstone mainly ofthe Adelaide Subgroup (Beaufort Group, Karoo Supergroup). Volksrust Formation mudstones of the Ecca Group (also Karoo Supergroup) dominate the western part of the area. Deep (>300 mm) layer of red sand (aeolian origin) covers the more clayey B-horizons. Soil forms such as arable Hutton, Bainsvlei and Bloemdal occur here and are typical of the Ca land type. The Ea land type has shallow gravelly soils underlain by dolerite sills. Ca and Ae land types are nearly equally represented.

5. RELEVANT LEGISLATION

The Constitution of the Republic of South Africa Act (Act No. 108 of 1996) – Section 24.

The Constitution is South Africa's overarching law. It prescribes minimum standards with which existing and new laws must comply. Chapter 2 of the Constitution contains the Bill of Rights in which basic human rights are enshrined. Government's commitment to give effect to the environmental rights enshrined in the Constitution is evident from the enactment of various pieces of environmental legislation since 1996, including the National Water Act, the National Environmental Management Act, etc.

National Environmental Management Act (Act No. 107 of 1998) (NEMA), as amended.

NEMA replaces a number of the provisions of the Environment Conservation Act, 1989 (Act No. 73 of 1989). The Act provides for cooperative 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. The principles enshrined in NEMA guide the interpretation, administration and implementation of the Act with regards to the protection and / or management of the environment. These principles serve as a framework within which environmental management must be formulated. Section 2(4) specifies that "sustainable development requires the consideration of all relevant factors including aspects specifically relevant to biodiversity":

National Environmental Management: Biodiversity Act (Act No. 10 of 2004) (NEMBA).

NEMBA provides for the management and conservation of biological diversity and components thereof; the use of indigenous biological resources in a sustainable manner; the fair and equitable sharing of benefits rising from bio-prospecting of biological resources; and cooperative governance in biodiversity management and conservation within the framework of NEMA.

National Water Act (Act No. 36 of 1998) (NWA).

The National Water Act (NWA) is a legal framework for the effective and sustainable management of water resources in South Africa. Central to the NWA is recognition that water is a scarce resource in the country which belongs to all the people of South Africa and needs to be managed in a sustainable manner to benefit all members of society. The NWA places a strong emphasis on the protection of water resources in South Africa, especially against its exploitation, and the insurance that there is water for social and economic development in the country for present and future generations.

The National Water Act, requires any development to secure Water Use Licences with the following activities:

Section 21 (a), abstractive use of water for construction (if possible and required).

Section 21 (c) and (i) use, i.e. river or wetland crossings, which includes any drainage lines by any infrastructure.

Other Relevant Legislations and Guidelines:

- DWS Wetlands Delineation and Riparian area determination Guideline, 2005;
- Biodiversity management plans (BMP);
- National biodiversity assessment (NBA); and
- Integrated Development Plan (IDP).

6. WETLAND ASSESSMENT FOR THE STUDY AREA

The purpose of the wetland assessment is to determine the relative importance, sensitivity, and current conditions of the significant aquatic features in order to assess the impact of the proposed residential township establishment on those aquatic resources. The assessment is also required to make recommendations in terms of mitigation measures that can be used to prevent or minimise the impact on the aquatic resources.

6.1. CLASSIFICATION OF WETLANDS

Wetlands are known to perform several important functions within ecosystems. These include flood attenuation, sediment trapping, improving water quality and being areas of rich biodiversity. However, most of the wetlands are disturbed and lost due to numerous natural disasters, human associated alteration and destruction and climate change effects both locally and globally.

It is important to note that, should one of these wetland functions be greatly affected, this does not necessarily mean that all the wetland functions are affected, but other functions can still be intact. For example, should the flood attenuation function of a wetland be greatly reduced through the cutting of vegetation across the site, this does not necessarily mean that the wetlands ability to purify water has also been lost. This obviously depends on the degree and nature of disturbance. Wetlands still maintain some degree of functionality regardless of the inflicted disturbance unless they are completely removed for infrastructure development.

Pressures arising from social and economic needs have resulted in widespread degradation of freshwater ecosystems. National Freshwater Ecosystem Priority Areas (NFEPA) aims to provide strategic spatial priorities for conserving South African freshwater ecosystems and support sustainable use of water resources. Therefore, implementing both the NWA and the RAMSAR Convention definition of wetland they map and prioritize these areas based on the criteria which look at their modification or alteration and ecosystem functionality. Under the NFEPA the assessed wetlands are categorized as natural or artificial and each wetland significance to the ecosystem functioning.

The wetland assessment consists of the following aspects: Wetland classification; Wetland integrity; and Ecosystem services supplied by the wetland.

The classification of the wetlands in the study area into different wetland types was based on the WET-EcoServices technique (Kotze et al, 2005). The WET-EcoServices technique

identifies seven main types of wetland based on hydro-geomorphic characteristics (Table 4).

The table (Table 4) below defines the wetland types as seen in (Fig. 7) as classified by Rand Water, 2011 and defined by Kotze et al., 2007 and Ollis et al, 2013.

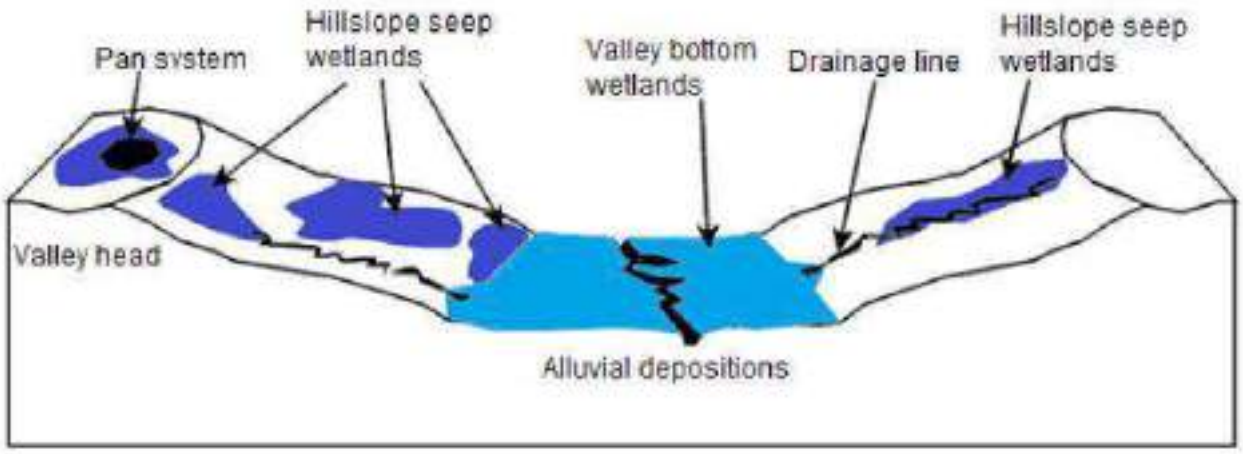


Figure 7: Wetland types as classified by Kotze et al, 2007 and Ollis et al, 2013.

Table 4: Wetland hydro-geomorphic types typically supporting inland wetlands in South Africa.

Hydro-geomorphic types	Description	Source of water maintaining the wetland[1]	
		Surface	Sub-surface
Floodplain	Valley bottom areas with a well-defined stream channel, gently sloped & characterized by floodplain features such as oxbow depressions and natural levees and the alluvial (by water) transport and deposition of sediment, usually leading to a net accumulation of sediment. Water inputs from main channel (when channel banks overspill) and from adjacent slopes.	***	*
Valley bottom with a channel	Valley bottom areas with a well-defined stream channel but lacking characteristic floodplain features. May be gently sloped and characterized by the net accumulation of alluvial deposits or may have steeper slopes and be characterized by the net loss of sediment. Water inputs from main channel (when channel banks overspill) and from adjacent slopes.	***	*/***
Valley bottom without a channel	Valley bottom areas with no clearly defined stream channel usually gently sloped and characterized by alluvial sediment deposition, generally leading to accumulation of sediment. Water inputs mainly from channel entering the wetland and also from adjacent slopes.	***	*/***
Hillslope seep with stream channel	Slopes on hillsides, which are characterized by colluvial (transported by gravity) movement of materials. Water inputs are mainly from sub-surface flow and outflow is usually via a well-defined stream channel connecting the area directly to a stream channel.	*	***
Isolated hillslope seepage	Slopes on hillsides, which are characterized by the colluvial (transported by gravity) movement of materials. Water inputs	*	***

	mainly from sub-surface flow and outflow either very limited or through diffuse sub-surface and/or surface flow but with no direct surface water connection to a stream channel.		
Depression (includes pans)	A basin shaped area with a closed elevation contour that allows for accumulation of surface water (i.e. it is inward draining). It may also receive sub-surface water. An outlet is usually absent, and therefore this type is usually isolated from the stream channel network.	*/***	*/***

[1] Precipitation is an important water source and evapotranspiration an important output

Water source: * Contribution usually small

** Contribution usually large

*** Contribution may be small or important depending on local circumstances

According to Table 1 the natural wetland features within the study area can be classified as follows:

Name	Depression
Qauternary catchment	C52F
Water Management Area	UPPER ORANGE
System	Inland
Ecoregion	Dry Highveld Grassland Group 3
Landscape setting	Flat
Seasonality	Perennial
Anthropogenic influence	Major disturbances due to surrounding activities (livestock grazing and dumping)
Vegetation	Primarily within Bloemfontein Dry Grassland

6.2. WETLAND INTEGRITY

The Present Ecological Status (PES) Method (DWAF 2005) was used to establish the integrity of the wetlands/pans in the study area and was based on the modified Habitat Integrity approach developed by Kleynhans (DWAF, 1999; Dickens et al, 2003). Table 5 shows the criteria and results from the assessment of the habitat integrity of the wetlands.

Table 5: Habitat integrity assessment criteria for palustrine wetlands (Dickens et al, 2003).

Criteria & Attributes	Relevance
Hydrologic	
Flow Modification	Consequence of abstraction, regulation by impoundments or increased runoff from human settlements or agricultural land. Changes in flow regime (timing, duration, frequency), volumes, velocity which affect inundation of wetland habitats resulting in floristic changes or incorrect cues to biota. Abstraction of groundwater flows to the wetland.
Permanent Inundation	Consequence of impoundment resulting in destruction of natural wetland habitat and cues for wetland biota.
Water Quality	
Water Quality Modification	From point or diffuse sources. Measure directly by laboratory analysis or assessed indirectly from upstream agricultural activities, human settlements and industrial activities. Aggravated by volumetric decrease in flow delivered to the wetland.
Sediment Load Modification	Reduction due to entrapment by dams or increase due to land use practices such as overgrazing. Cause of unnatural rates of erosion, accretion or infilling of wetlands and change in habitats.
Hydraulic/Geomorphic	
Canalisation	Results in desiccation or changes to inundation patterns of wetland and thus changes in habitats. River diversions or drainage.

Topographic Alteration	Consequence of infilling, ploughing, dykes, trampling, bridges, roads, railway lines and other substrate disruptive activities that reduce or change wetland habitat directly in inundation patterns.
Biota	
Terrestrial Encroachment	Desiccation of wetland and encroachment of terrestrial plant species due to changes in hydrology or geomorphology. Change from wetland to terrestrial habitat and loss of wetland functions.
Indigenous Vegetation Removal	Direct destruction of habitat through farming activities, grazing or firewood collection affecting wildlife habitat and flow attenuation functions, organic matter inputs and increases potential for erosion.
Invasive Plant Encroachment	Affects habitat characteristics through changes in community structure and water quality changes (oxygen reduction and shading).
Alien Fauna	Presence of alien fauna affecting faunal community structure.
Over use of Biota	Overgrazing, over fishing, etc.

7. ASSESSMENT RESULTS

7.1. SOIL WETNESS AND SOIL FORM INDICATOR

Soil samples were taken within the development footprint and examined for the presence of hydric (wetland) characteristics. Hydric soils are defined as those that typically show characteristics (redoximorphic features) resulting from prolonged and repeated saturation. Redoximorphic features include the presence of mottling (i.e. bright insoluble iron compounds); a gleyed matrix; and/or Mn/Fe concretions. The presence of redoximorphic features are the most important indicator of wetland occurrence, as these soil wetness indicators remain in wetland soils, even if they are degraded or desiccated (DWAF, 2005). It is important to note that the presence or absence of redoximorphic features within the upper 500mm of the soil profile alone is sufficient to identify the soil as being hydric, or non-hydric (Collins, 2005). Hydric properties were observed on the soil samples taken along the natural wetland (Fig. 8).

Figure 8: Soil samples from the natural depression wetland.

7.2. VEGETATION INDICATOR

According to DWAF (2005), vegetation is regarded as a key component to be used in the delineation procedure for wetlands. Vegetation also forms a central part of the wetland definition in the National Water Act (Act 36 of 1998). Hydrophytic vegetation are plant species that are adapted to being permanently or temporarily waterlogged conditions (elevated water conditions in wetland soils). These wetland “indicator” species assist in the identification of wetland systems and associated boundaries. However, using vegetation as a primary wetland indicator requires undisturbed conditions (DWAF, 2005); vegetation

within the proposed development footprint has been severely disturbed as a result of anthropogenic disturbance.

7.3. TERRAIN INDICATOR

The topography of an area is generally a good practical indicator for identifying those parts in the landscape where wetlands are likely to occur. Generally, wetlands occur as a valley bottom unit however wetlands can also occur on steep to mid slopes where groundwater discharge is taking place through seeps (DWAF, 2005). In order to classify a wetland system, the localised landscape setting must be taken into consideration through ground-truthing of the study site after initial desktop investigations (Ollis et al., 2014).

The proposed development sits on a generally flat area, with few slopes towards the north eastern direction of the site. As a result, the only natural wetland on site is a depression, and the other two are artificial.

7.4. PRESENT ECOLOGICAL STATUS (PES)

The wetlands were assessed in terms of their health and they were all found to have undergone severe modifications (Table 6). The scores indicate that the wetlands have limited functioning ecosystem processes.

Table 6: Summary of PES score

	HYDROLOGY	GEOMORPHOLOGY	VEGETATION	PES SCORE (CATEGORY)
ARTIFICIAL WETLANDS	9.5	9.9	9.1	F (9,50)
NATURAL WETLAND	7.5	7.0	7.0	E (7.20)

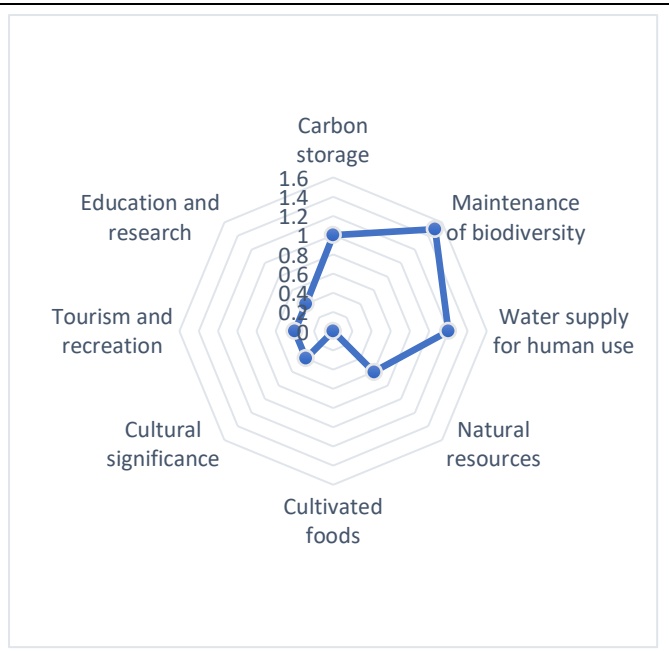
7.5. ECOSYSTEM SERVICES PROVIDED BY THE WETLANDS

The assessment of the ecosystem services supplied by the wetlands was conducted according to the guidelines as described by Kotze *et* al (2005). An assessment was undertaken that examines and rates the services listed in Table 7. The characteristics were scored according to the general levels of services provided. It is important to ensure that these wetland areas can continue to provide the valued goods and services.

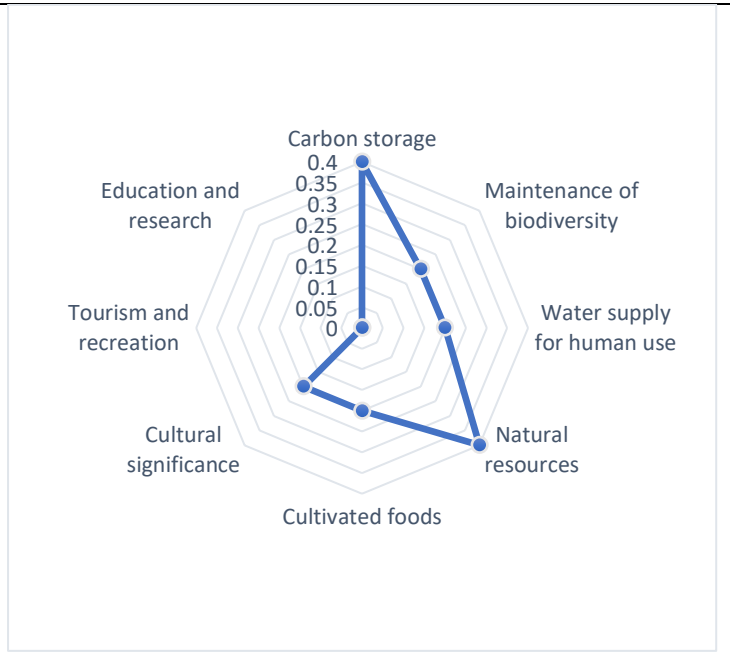
Table 7: Goods and services assessment results for wetland (high=4; low=0)

GOODS AND SERVICES	WETLAND 1 (Natural)	WETLAND 2 (Artificial	WETLAND 3 (Artificial)
Flood attenuation	2.0	0.8	0.2
Stream flow regulation	1.2	0.8	0.2
Sediment trapping	1.0	0.8	0.2
Phosphate trapping	1.0	0.6	0.2
Nitrate removal	0.8	0.6	0.2
Toxicant removal	0.8	0.6	0.2

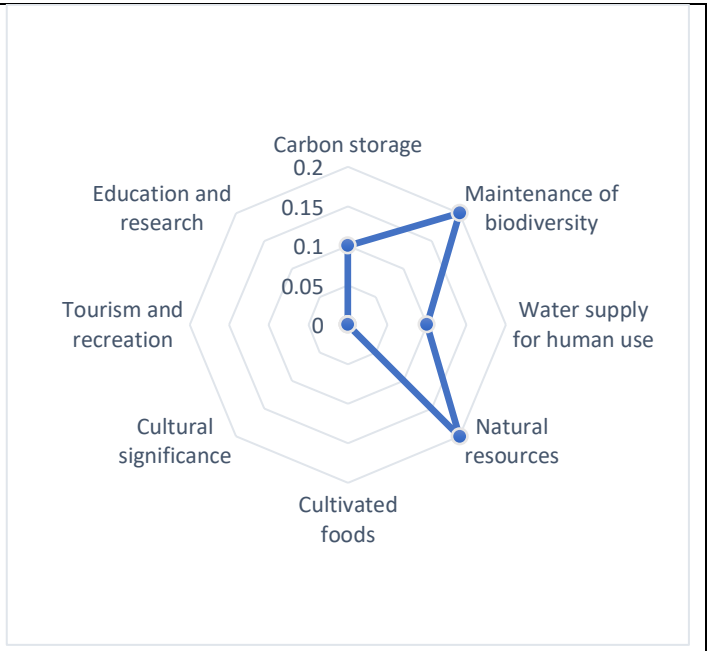
Erosion control	1.0	0.8	0.2
Carbon storage	1.0	0.4	0.1
Maintenance of biodiversity	1.5	0.2	0.2
Water supply for human use	1.2	0.2	0.1
Natural resources	0.6	0.4	0.2
Cultivated foods	0.0	0.2	0.0
Cultural significance	0.4	0.2	0.0
Tourism and recreation	0.4	0.0	0.0
Education and research	0.4	0.0	0.0



Wetland 1 (Natural)



Wetland 2 (Artificial)



Wetland 3 (Artificial)

Figure 9: General WET-EcoServices results for the wetlands.

7.6. ECOLOGICAL IMPORTANCE AND SENSITIVITY (EIS)

The Ecological Importance and Sensitivity of the wetlands have been recorded as being low (Table 8), as a result of the limited functional integrity and health associated with these wetlands. The wetlands do not provide limited ecological support within the larger landscape.

Table 8: Summary of the Ecological Importance and Sensitivity

HGM UNIT	EIS	SCORE	CONFIDENCE	CATEGORY
DEPRESSION	Ecological Importance and Sensitivity	0.1	2.50	Very Low
	Hydrological Functional Importance	1.00	2.00	Very Low
	Direct Human Benefits	0	3.00	Very Low
ARTIFICIAL SEEP	Ecological Importance and Sensitivity	0.08	2.50	Very Low
	Hydrological Functional Importance	0.6	2.80	Very Low
	Direct Human Benefits	0	3.00	Very Low

8. CONSTRAINTS MAP

There is a natural wetland located west of the study site (W1, Fig 11). In addition to this wetland, there are two artificial wetlands around the study area (W2 &W3, Fig 11). According to the developer's layout, only artificial wetland 2 will be impacted by the development. The proposed activities of the township are less likely to impact the natural wetland (W1) and the other artificial wetland (W3).

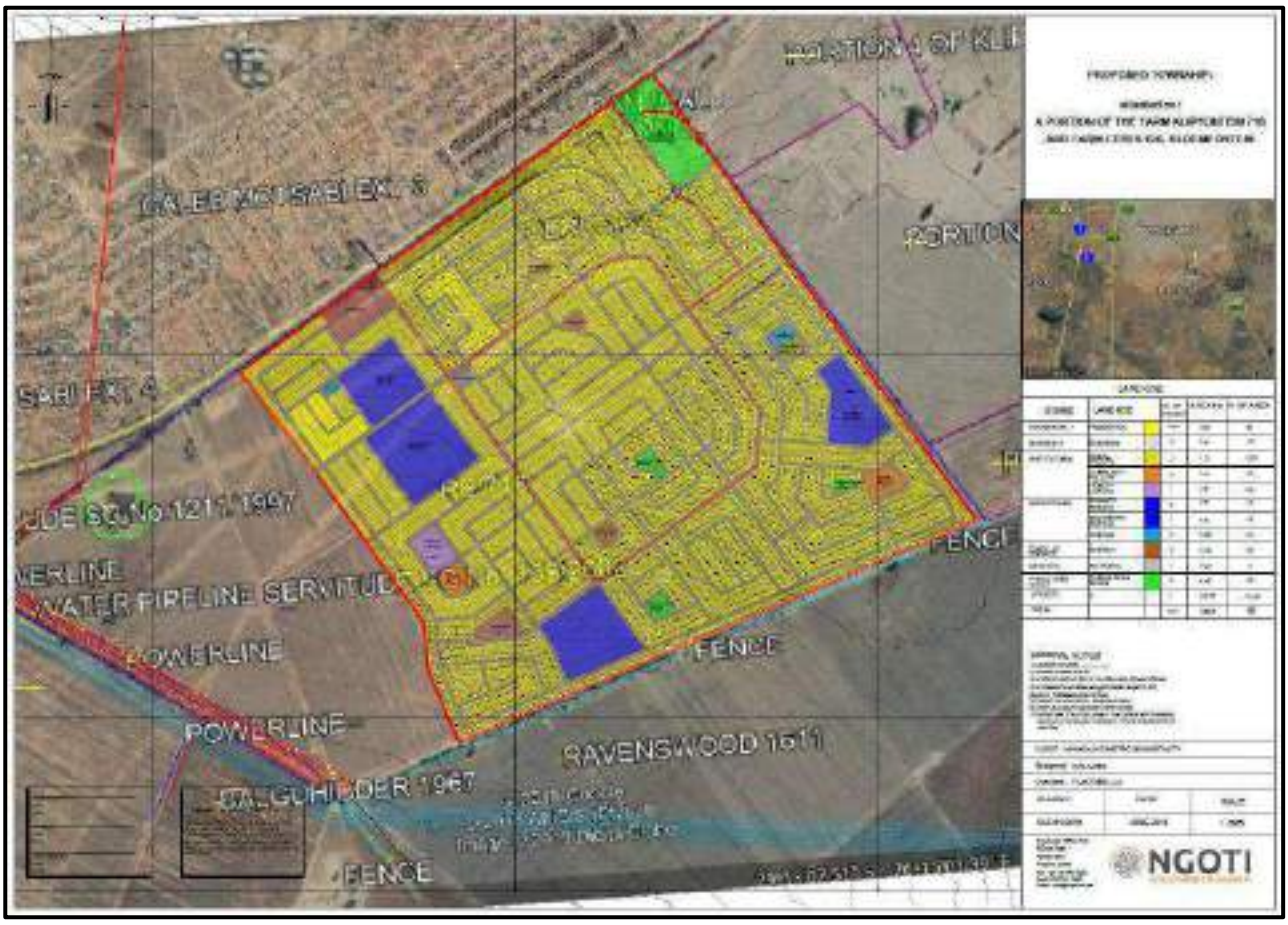


Figure 10: Site development plan. ©NGOTI Development Consultants.

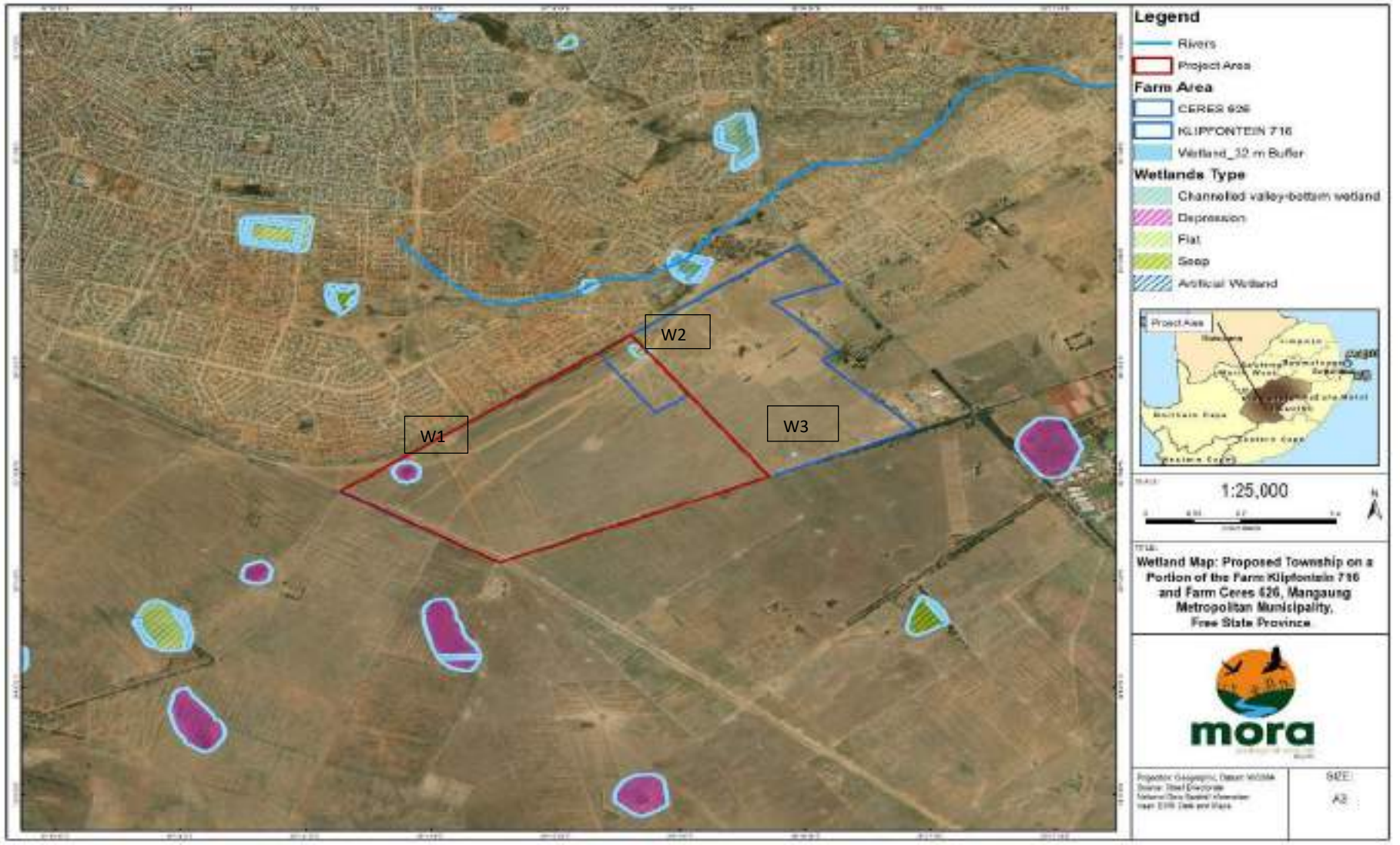


Figure 11: Location of the aquatic features in relation to the proposed township establishment site.

9. IMPACT DESCRIPTION, ASSESSMENT AND MITIGATION

Any development activity in a natural system will have an impact on the surrounding environment, usually in a negative way. The purpose of this phase of the study was to identify and assess the significance of the impacts caused by the proposed construction of the residential development on the downstream watercourse within the valley bottom and to provide a description of the mitigation required so as to limit the identified negative impacts on the receiving environment.

The impact assessment identified the following negative impacts associated with the proposed development;

(i) soil erosion and sedimentation of the watercourse system; and
(ii) pollution as a result of runoff from the construction area entering into the watercourse.

9.1. Soil erosion, sedimentation and degradation

Impacts associated with soil erosion and sedimentation										
Potential impact	Probability		Duration		Extent		Magnitude		Significance scoring without mitigation	Significance scoring with mitigation
	Without	With	Without	With	Without	With	Without	With		
Construction Phase										
Soil erosion and sedimentation	5	4	2	2	2	1	8	4	60 (High)	28 (Low)
Operational Phase										
Degradation of waterbodies	3	2	5	5	2	1	8	6	45 (Moderate)	24 (Low)

Description of impact

Construction activities (i.e. excavations and vegetation clearing) expose soil to environmental factors including rainfall and wind. The exposure to these factors will result in the removal of topsoil and the deposition of this sediment in the downslope watercourse system. This increased high-suspended particulate matter within the watercourse can accumulate particularly during the summer months leading to the sedimentation of this system. This poses a risk to the geomorphological/functional integrity of the water resource system, reducing its ecological integrity.

Mitigation Options

- Attenuation of stormwater from the development site is important to reduce the velocity of runoff into the downstream wetland area.

- Attenuation measures during construction include but are not limited to – the use of sand bags, hessian sheets, silt fences, retention or replacement of vegetation and geotextiles such as soil cells which must be used in the protection of slopes.
- Long term attenuation measures are recommended in the design of the development and can include permeable paving; infiltration trenches or swales.

9.2. Pollution of waterbodies and soil

Impacts associated with soil erosion and sedimentation										
Potential impact	Probability		Duration		Extent		Magnitude		Significance scoring without mitigation	Significance scoring with mitigation
	Without	With	Without	With	Without	With	Without	With		
Construction Phase										
Pollution of waterbodies and soil	4	3	2	2	2	1	8	6	48 (Moderate)	28 (Low)
Operational Phase										
Pollution of waterbodies and soil	3	2	5	5	2	1	6	4	39 (Moderate)	24 (Low)

Description of the impact

from a Sediment release construction site into the downstream aquatic environment is one of the most common forms of waterborne pollution. Furthermore, mismanagement of waste and pollutants including hydrocarbons, construction waste and other hazardous chemicals will result in these substances entering and polluting the sensitive natural downstream environments either directly through surface runoff during rainfall events, or subsurface water movement.

Mitigation Options

- All waste generated during construction is to be disposed of as per an Environmental Management Programme (EMPr) and washing of containers, wheelbarrows, spades, picks or any other equipment that has been contaminated with cement or chemicals in the identified watercourses must be strictly prohibited.
- Proper management and disposal of construction waste must occur during the construction of the development.
- Waste disposal during the operational phase must ensure no litter or other contaminants on site are deposited in the downstream water resource environment.
- No release of any substance i.e. cement or oil, that could be toxic to fauna or faunal habitats within the watercourse.
- Spillages of fuels, oils and other potentially harmful chemicals must be cleaned up immediately and contaminants properly drained and disposed of using proper solid/hazardous waste facilities (not to be disposed of within the natural

environment). Any contaminated soil must be removed, and the affected area rehabilitated immediately.

10. RISK ASSESSMENT

The Risk Assessment for the proposed project as per the General Authorisation in terms of Section 39 of the National Water Act, 1998 (Act No. 36 of 1998) for Water Uses as defined in Section 21 (c) and (i) (Notice 509 of 2016) was undertaken.

The risk assessment involves the analysis of the risk matrix provided in Appendix 1 of this Notice and involves the evaluation of the severity of impacts to the flow regime, water quality, habitat, and biota of the water resource. Based on the outcome of the Risk Assessment Matrix, Low risk activities will be generally authorised with conditions, while Moderate to High risk activities will be required to go through a Water Use Licence Application Process. Water use activities that are authorised in terms of the General authorisations will still need to be registered with the Department of Water and Sanitation.

The risk assessment of the assessed wetlands is attached in the Appendix A. Due to the limited ecosystem goods and services provided by the wetlands, all potential impacts on these waterbodies received Low Risk Scores. The proposed township establishment will therefore not result in the net loss of natural wetlands within the catchment, and it is the recommendation of the specialist that the project be considered.

11. CONCLUSION AND RECOMMENDATIONS

The assessment revealed that there is one natural wetland within the study site, but it is less likely to be impacted by the development. There are also two other artificial wetlands, and one is likely to be impacted by the development. Although the wetland that is likely to be affected by the development is an artificial and has limited functioning ecosystem process, it can be conserved in order to provide the livestock with drinking water.

The natural depression wetland within the study area is in a largely moderately modified state as a result of physical habitat modification. Furthermore, the wetland provides limited goods and services.

The following mitigation measures are proposed for the project:

- Although the natural wetland is at significant distance from the layout, the contractor should ensure that no waste/litter from their activities reaches the natural wetland
- During construction, the wetland areas should be fenced marked as a no go area for labour force.
- During and after construction of the infrastructure, ensure effective storm water management around permanent infrastructure, rehabilitate disturbed areas using indigenous vegetation, protect topsoil and avoid sensitive soils on steep slopes. This will reduce the possibility of soil erosion.

- Reseeding with indigenous grasses should be implemented in all affected areas and strategic planting of grassland species should take place to re-establish microclimates and niche habitats.
- Proper toilet facilities must be located outside the sensitive areas; the impact of human waste on the natural system is immense. Chemical toilets must be provided which should always be well serviced and spaced as per occupational health and safety laws, construction regulations and placed outside the buffer.
- No construction personnel are allowed to collect, harvest or kill any species of fauna and flora on the site.
- Removal of the alien and weed species encountered on the property must take place in order to comply with existing legislation (amendments to the regulations under the Conservation of Agricultural Resources Act, 1983 and Section 28 of the National Environmental Management Act, 1998). Removal of species should take place throughout the construction and operational phases.
- Informal fires should be prohibited during all development phases.

It is the opinion of the specialist that the proposed township be considered, provided that the recommendations are adhered to.

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13. APPENDICES

APPENDIX A: RISK ASSESSMENT

Matrix assists DWS to determine where the proposed development triggers a Water Use License Authorization (WULA) or Water Use General Authorisation (WUGA). The risk assessment is based on the Department of Water and Sanitation 2015 publication: Section 21c and i water use Risk Assessment Protocol in Government Gazette no. 40229 dated 26 August 2016.

NAME and REGISTRATION No of SACNASP Professional member: Mokgatla Molepo Reg No: 009509

Risk Assessment Matrix - Total Severity Score with Mitigation

No.	Phases	Activity	Aspect	Impact	Flow Regime		Physico & Chemical (Water Quality)		Habitat (Geomorph + Vegetation)		Biota
1	Construction phase	Construction of residential units	Infrastructure within 32 m of the artificial wetland	Possible pollution and reduction of the artificial wetland	**1**		**1**		**1**		**1**
2	Operational Phase	Maintenance of the development	Sediment deposition within the artificial wetland	Soil compaction, erosion and sediment deposition2	**2**		**2**		**1**		**1**

Risk Assessment Matrix – Final Risk Rating

No	Severity	Spatial scale	Duration		Consequence		Frequency of activity	Frequency of impact	Legal Issues	Detection		Likelihood	Significance	Risk Rating
1	**1**	**1**	**1**		**3**		**4**	**1**	**5**	**1**		**11**	**33**	LOW
2	**1.5**	**1**	**1**		**3.5**		**4**	**1**	**5**	**1**		**11**	**38.5**	LOW

Risk Assessment Matrix – Confidence Level and Proposed Post Control/Mitigation Measures

No	Risk Rating	Confidence level	Control Measures	Borderline LOW MODERATE Rating Classes	PES AND EIS OF WATERCOURSE
1	LOW	**80%**	Revise the layout to accommodate the artificial wetland	N/A	The artificial wetland is considered to be of very low ecological importance
2	LOW	**80%**	Revise the layout to accommodate the artificial wetland	N/A	The artificial wetland is considered to be of very low ecological importance

APPENDIX B: GLOSSARY OF ACRONYMS

BGIS Biodiversity Geographic Information System

CR Critically Endangered

DEA Department of Environmental Affairs

EIA Environmental Impact Assessment

EN Endangered

EW Extinct in the Wild

EX Extinct

EA Environmental Authorization

EIS Ecological Important Services

IEM Integrated Environmental Management

IUCN International Union for Conservation of Nature

LC Least Concern

ME Mitigation Efficiency

NBA National Biodiversity Assessment

NBSAP National Biodiversity Strategy and Action Plans

NEMBA National Environmental Management Biodiversity Act

NFEPA National Freshwater Ecosystem Priority Areas

NT Near Threatened

NWA National Water Act

PES Present Ecological State

QDS Quarter Degree Square

R Rare

RDL Red Data List

SANBI South African National Biodiversity Institute

SCC Species of Conservation Concern

ToR Terms of Reference

VU Vulnerable

WMA Water Management Areas

mora
ecological services

+27 81 410 3763
+27 84 360 0211

APPENDIX D2: FLOODLINE REPORT

CIVILCONSULT
Consulting Engineers

MANGAUNG METROPOLITAN MUNICIPALITY

TOWNSHIP ESTABLISHMENT ON A PORTION OF THE FARM KLIPFONTEIN 716 AND THE FARM CERES 626, BLOEMFONTEIN

FLOOD LINE ANALYSIS AND DETERMINATION REPORT

PROJECT NO. 2698

AUGUST 2019

MANGAUNG METROPOLITAN MUNICIPALITY

TOWNSHIP ESTABLISHMENT ON A PORTION OF THE FARM KLIPFONTEIN 716 AND THE FARM CERES 626, BLOEMFONTEIN

FLOOD LINE ANALYSIS AND DETERMINATION REPORT

CIVILCONSULT

1. CLIENT :

Name of Client	NGOTI Development Consultants
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Fax No.	086 641 0575
E-mail	fnmathebula@gmail.com / fumani@ngoti.co.za / info@ngoti.co.za

2. LOCAL AUTHORITY :

Local Authority	Mangaung Metropolitan Municipality (Roads- and Storm Water)
Contact Person(s)	Heinrich Arpen
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Telephone No. / Cell No.	051-410 6715 / 083 512 0283
Fax No.	051-410 6718
E-mail	heinrich.arpin@mangaung.co.za

3. COMPILED BY :

Company	CIVILCONSULT Projects (Pty) Ltd
Contact Person	Leon Wentzel (ECSA No 950052)
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MANGAUNG METROPOLITAN MUNICIPALITY : TOWNSHIP ESTABLISHMENT ON A PORTION OF THE FARM KLIPFONTEIN 716 AND THE FARM CERES 628, BLOEMFONTEIN : FLOOD LINE ANALYSIS AND DETERMINATION REPORT

TABLE OF CONTENTS

LIST OF ANNEXURES

MANGAUNG METROPOLITAN MUNICIPALITY : TOWNSHIP ESTABLISHMENT ON A PORTION OF THE FARM KLIPFONTEIN 716 AND THE FARM CERES 626, BLOEMFONTEIN : FLOOD LINE ANALYSIS AND DETERMINATION REPORT

1. INTRODUCTION

CIVILCONSULT Projects (Pty) Ltd was appointed by NGOTI Development Consultants to determine the 1:50 and 1:100-year flood lines and to compile a Flood Line Analysis and Determination Report for the Township Establishment on a Portion of the Farm Klipfontein 716 and the Farm Ceres 626, Bloemfontein.

For the purposes of this report we will refer to the Township Establishment on a Portion of the Farm Klipfontein 716 and the Farm Ceres 626, Bloemfontein as the Proposed Development.

2. PROFESSIONAL TEAM

The professional team is as follows :

Professional Discipline	Name of Entity	Contact Person(s)
Client	NGOTI Development Consultants	Fumani Mathebula
Topographical Survey	CIVILCONSULT Projects (Pty) Ltd	Eben Terblanche / Ruan Beukes
Civil Engineers (Flood Lines)	CIVILCONSULT Projects (Pty) Ltd	Eben Terblanche

3. LOCATION OF THE DEVELOPMENT AND WATERCOURSE

The Proposed Development is located on a Portion of the Farm Klipfontein 716 and the Farm Ceres 626 in Bloemfontein, Free State Province.

The Proposed Development is bounded by the Provincial Road R702 to the north-west. Portion 4, 5 and 2 of the Farm Klipfontein 716 forms the north-eastern boundary of the Proposed Development. The southern boundary is formed by the Farm Ravenswood 1611 and the south-western boundary is formed by the Remainder of the Farm Klipfontein 716.

A tributary to the Renosterspruit originates inside the Proposed Development and the flood lines of this watercourse was determined.

Refer to Annexure A, Drawing No. 2698/100/01/00 for a Locality Plan of the Proposed Development.

4. CATCHMENT AREAS

One (1) catchment area was identified for the Proposed Development i.e. Catchment Area 1.

Catchment Area 1 consists of the catchment area of the tributary of the Renosterspruit upstream of the Proposed Development.

The total catchment area is approximately 23.951km² and forms part of the Quaternary Drainage Region C52F as indicated by the Department of Water and Sanitation (DWS).

The catchment originates to the south and south-west of the Proposed Development. The catchment area consists of undisturbed natural bush, grasslands and farm and agricultural portions.

There is a low-cost housing development and informal settlements located to the north-west of the Proposed Development.

The undisturbed areas will be developed in future and the development of the existing rural area is expected.

The catchment slopes vary typically from 1% to 5%.

Refer to Annexure B, Drawing No. 2696/101/01/00 and 2696/101/02/00 indicating the catchment area upstream of the Proposed Development.

5. CALCULATION OF FLOOD PEAKS

5.1 General

The impact of the flood lines of the tributary of the Renoster spruit on the Proposed Development was determined and a section of the tributary to the Renoster spruit was analysed for this purpose.

The criteria used to determine the flood peaks, are shown in Table 5.1 below.

Table 5.1 : Data for Catchment Areas

Name of Watercourse	Catchment Area No.	Size (km^2)
Tributary of the Renoster spruit	1	± 23.951km^2

5.2 Hydrological Data and Flood Peaks

The software used to determine the flood peaks are the Utility Programs for Drainage Version 1.0.2 by Sinotech.

The criteria used to determine the flood peaks, are shown in Tables 5.2.1 and 5.2.2 below.

Table 5.2.1 : Hydrological Data of Catchment Area 1

Item No.	Determination Element	Criteria
1.	Methods	Alternative Rational, Unit Hydrograph, SDF and Empirical
2.	Quaternary Drainage Region (DWS)	C52F
3.	Catchment area of the tributary to the Renoster spruit	± 23.951km^2
4.	Length of longest watercourse	± 6.512km
5.	Mean Annual Rainfall	561mm
6.	Flood Return Period	1:50 and 1:100 year
7.	Value of C Factor	0.432
8.	Total Height Difference along longest watercourse	27m
9.	Height Difference along 10 – 85 Slope	22m
10.	SDF Basin Number	9
11.	Rainfall Region	Inland

Table 5.2.2 : Calculated Flood Peaks of the tributary of the Renosterspruit

Method	Flood Peaks (1:50 years)	Flood Peaks (1:100 years)
Alternative Rational	110.32m³/s	130.00m³/s
Unit Hydrograph	85.22m³/s	116.32m³/s
SDF	154.71m³/s	195.92m³/s
Empirical	81.28m³/s	102.67m³/s

The SDF Method was used for the flood line analysis.

Refer to Annexure C for the calculation sheets of the flood peaks.

6. DETERMINATION OF FLOOD LINES

6.1 Software

The software used to determine the flood lines are Autodesk Civil 3D 2019 and HEC-Ras Watercourse Analysis Programs.

6.2 Description of Flood Plain adjacent to the Proposed Development

The flood plain of the tributary of the Renosterspruit consists of the following :

- natural bush
- grassland
- agricultural lands
- low cost housing developments and informal settlements
- an earth embankment dam located in the tributary to the Renosterspruit

An earth embankment dam is located in the north-eastern corner of the Proposed Development in the tributary to the Renosterspruit but has no formal spillway.

The 1:50 and 1:100-year flood lines will overtop this earth embankment dam.

Refer to Annexure D, Drawing No. 2698/120/01/00, 2698/121/01/00, 2698/121/02/00 and 2698/121/03/00 for details and the indication of the 1:50 and 1:100-year flood lines.

6.3 Technical Data Used to Determine the Flood Lines

The criteria used to determine the flood lines, are shown in Table 6.3 below.

Table 6.3 : Technical Data Used to Determine Flood Lines for the tributary to the Renosterspruit

Item No.	Determination Element	Criteria
1.	Cross Section Spacing	20m
2.	Cross Section Width	1000m
3.	Number of Cross Sections for the tributary to the Renosterspruit	186
4.	Flow Regime / Profile Type	Mixed
5.	Manning's 'n Value along River Banks	0.045
6.	Manning's 'n Value along River Centreline	0.035
7.	Type of Analysis	Steady Flow Analysis

7. CONCLUSION

We hereby certify that the positions of the 1:50 and 1:100-year flood lines for the section of the tributary of the Renosterspruit are as indicated on Drawing No. 2698/120/01/00.

The position of the 1:50 and 1:100-year flood lines were determined based on the information discussed in this report.

We trust that the above report meets with your requirements. Please contact us should you require any additional information.

.....
Leon Wentzel
for CIVILCONSULT Projects (Pty) Ltd

23/08/2019
.....
Date

ANNEXURE A

LOCALITY PLAN

NOTES / NOTAS

EXISTING DEVELOPMENT
PROPOSED DEVELOPMENT

REFERENCE / VERWYSINGS

MANGAUNG
AT THE HEART OF IT ALL

MANGAUNG METROPOLITAN MUNICIPALITY

CLIENT / KLIENT

NGOTI

NGOTI DEVELOPMENT CONSULTANTS

CIVILCONSULT
Consulting Engineers

DESIGNED / ONTWERP	: L. WENTZEL
DRAWN / GETEKEN	: E. FERREIRA
CHECKED / GEKONTROLEER	: P.C. PIENAAR

PROJECT / PROJEK

TOWNSHIP ESTABLISHMENT ON A PORTION OF THE FARM KLIPFONTEIN 716 AND FARM CERES 626 BLOEMFONTEIN

DRAWING NAME / TEKENING NAAM

LOCALITY PLAN

DATE / DATUM : JULY 2019
SCALE / SKAAL : AS SHOWN

NO. / NR.	DATE / DATUM	INITIAL / PARAF	DESCRIPTION / BESKRYWING

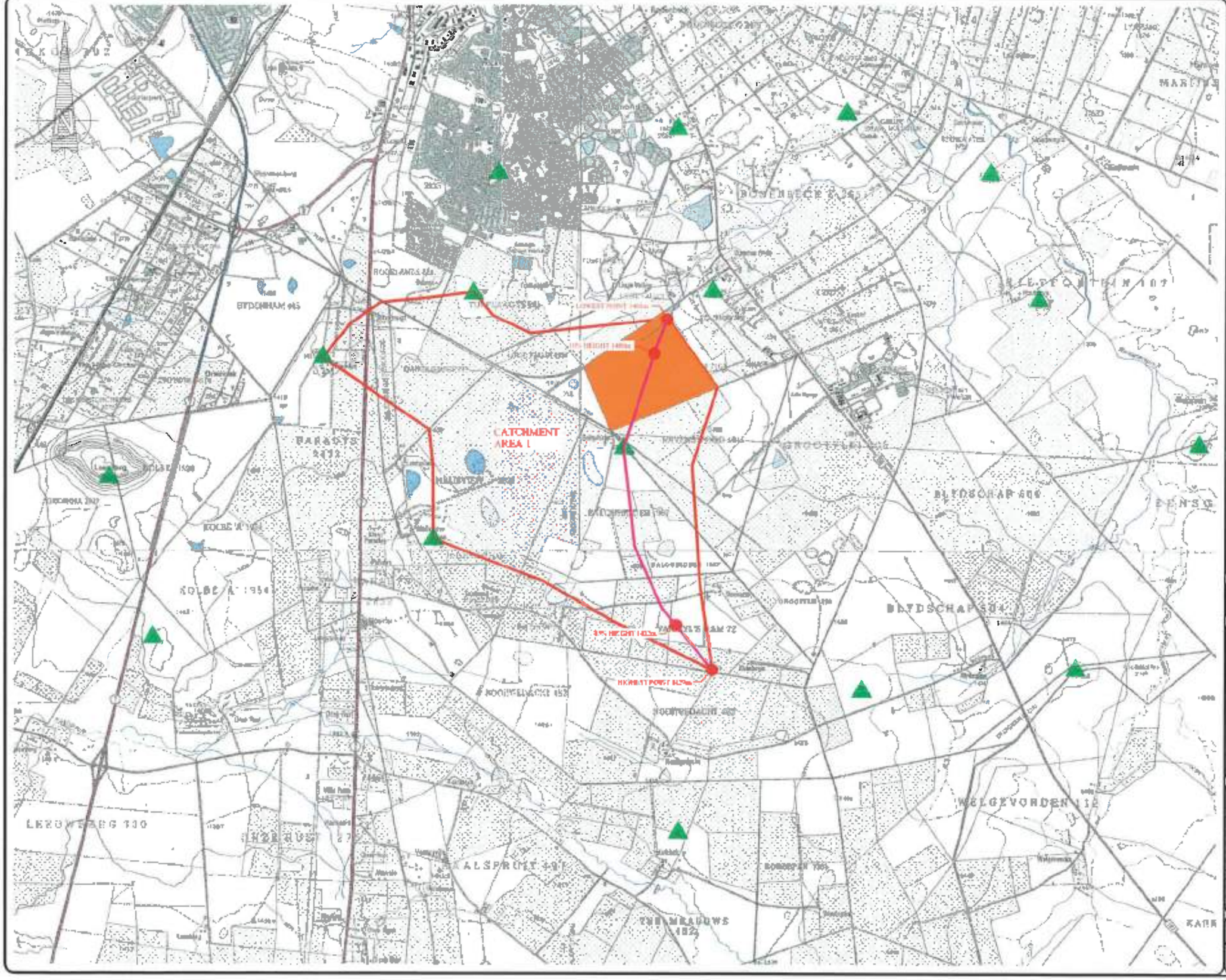
CC DWG. NO./CC TEK. NR.
2698/100/01/00

FILE NO./LÊER NR.

2698/100/01/00

ANNEXURE B

CATCHMENT AREA



NOTES / NOTAS

REFERENCE / VERWYSINGS

MANGAUNG METROPOLITAN MUNICIPALITY

NGOTI

CIVILCONSULT
Consulting Engineers

TOWNSHIP ESTABLISHMENT ON A PORTION OF THE FARM KLIPFONTEIN 716 AND THE FARM CERES 636

DRAWING TITLE / TEKENINGTITEL

FLOODLINES:
CATCHMENT AREAS
SHEET 1 OF 2

DATE / DATUM: AUGUST 2019
SCALE / SKAAL: 1:30 000

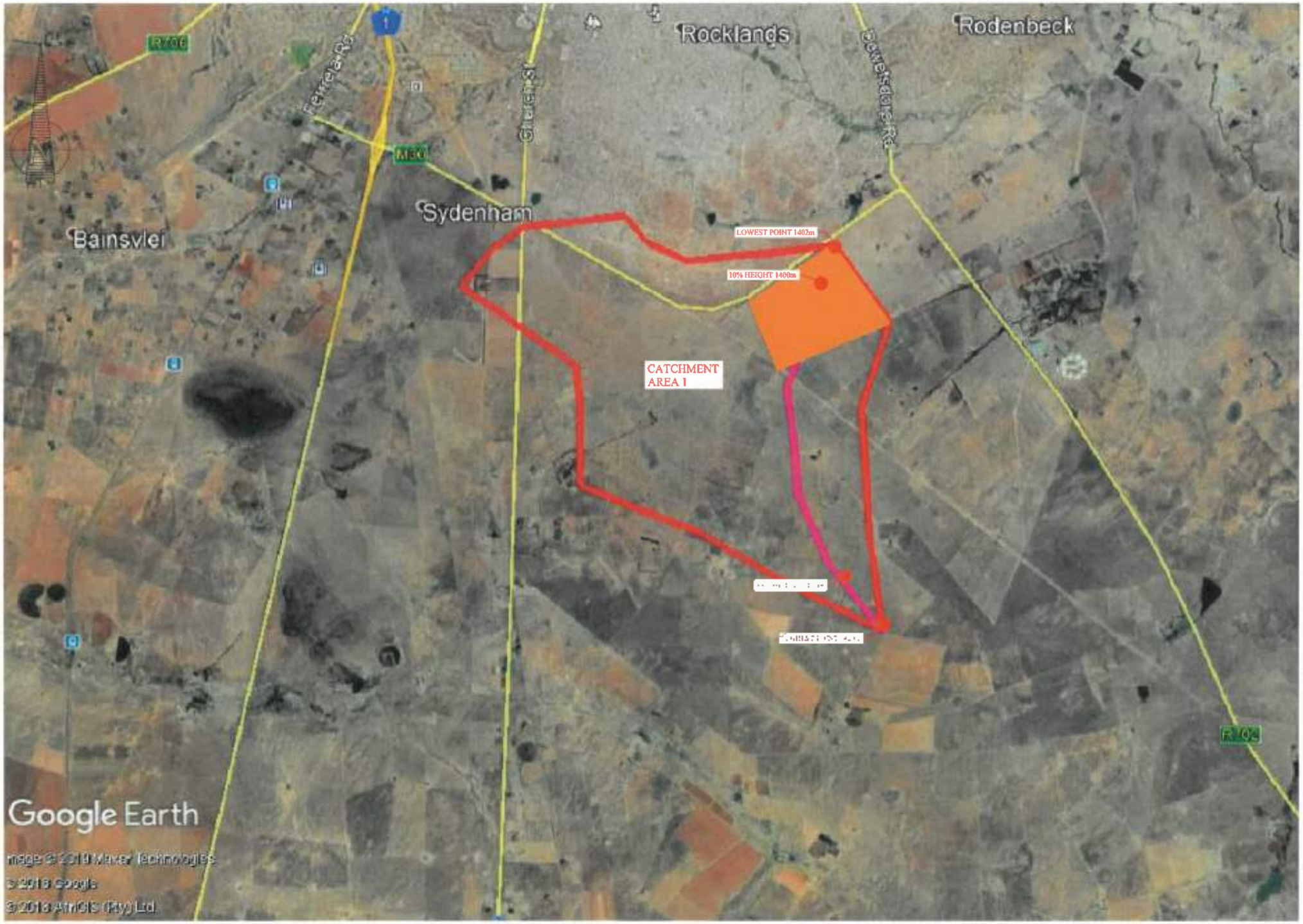
NR.	DATE	INITIALS	DESCRIPTION

CIVILCONSULT PROJECT NR.: 2698/101/01/00

FILE NO./AKTE NR.:

CLIENT'S ORDER NO./OPDRAG NR.:

2698/101/01/00



NOTES / NOTAS

REFERENCE / VERWYSINGS

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NGOTI

CIVILCONSULT
Consulting Engineers

TOWNSHIP ESTABLISHMENT ON A PORTION OF THE FARM KLIPFONTEIN 716 AND THE FARM CERES 626

FLOODLINES:
CATCHMENT AREAS
SHEET 2 OF 2

DATE : AUGUST 2018
DATUM :
SCALE : 1:30 000
SKAAL :

No.	DATE	INITIAL	DESCRIPTION

2698/101/A02/00

2698/101/02/00

ANNEXURE C

CALCULATION SHEETS FOR THE FLOOD PEAKS

Utility Programs for Drainage
Flood calculations

Sinotech

Project name:	**PORTION OF THE FARM KLIPFONTEIN 716 AND FARM CERES 636**
Analysed by:	**Eben Terblanche**
Name of river:	**Tributary To The Renosterspruit**
Description of site:	
Filename:	**P:\2698 (Mangaung, Ptn of Klipfontein 716-BD and Ceres 636-BD)\Qsurf\Flood line\Run-Off\Run-Off 30 July 2019.fld**
Date:	**20 August 2019**

Summary of peak flows (m³/s)

Method	1:2	1:5	1:10	1:20	1:50	1:100	1:200	Design year
Rational	29.90	41.58	53.70	67.59	89.30	111.64		70
Alternative rational	29.38	50.80	68.07	86.11	110.32	130.00	147.18	80
Unit hydrograph	17.82	29.46	42.51	58.33	85.22	115.32		65
Standard design flood	12.45	43.73	72.77	105.65	154.71	195.92	239.66	85
Empirical			50.48	58.18	81.28	102.67		65
Statistical: LN								
Statistical: LEV1								
Statistical: LP3								
Statistical: EV1								

Class of road = Class 1 Primary Distributors

The software programs were developed for the convenience of its users. Although every reasonable effort has been made to ensure that the programs are accurate and reliable the program developers, Sinotech CC, accept no liability of any kind for any results, interpretation thereof or any use made of the results obtained with these programs. All users of these programs do so entirely at their own risk.
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Utility Programs for Drainage
Flood calculations

Sinotech

Project name: PORTION OF THE FARM KLIPFONTEIN 716 AND FARM CERES 626
Analysed by: Eben Terblanche
Name of river: Tributary To The Renosterspruit
Description of site:
Filename: P:\2698 (Mangaung, Ptn of Klipfontein 716-RD and Ceres 636-RD)\Qsurf\Flood line\Run-Off\Run-Off 30 July 2019.ffd
Date: 20 August 2019

Flood Frequency Analysis: Alternative Rational Method

Project	= PORTION OF THE FARM KLIPFONTEIN 716 AND FARM CERES 626
Analysed by	= Eben Terblanche
Name of river	= Tributary To The Renosterspruit
Description of site	=
Date	= 20/08/2019
Area of catchment	= 35.951 km²
Dolomitic area	= 0.0 %
Length of longest watercourse	= 6.513 km
Flow of water	= Overland flow
Height difference	= 27.0 m
Value of r for over land flow	= Sparse grass (r=0,3)
Area distribution	= Rural: 70 %, Urban: 30 %, Lakes: 0 %

Catchment description - Urban area (%)

Lawns		Residential and industry		Business	
Sandy, flat (<2%)	0	Houses	0	City centre	0
Sandy, steep (>7%)	0	Flats	0	Suburban	0
Heavy soil, flat (<2%)	0	Light industry	100	Streets	0
Heavy soil, steep (>7%)	0	Heavy industry	0	Maximum flood	0

Catchment description - Rural area (%)

Surface slopes		Permeability		Vegetation	
Lakes and pans	0	Very permeable	25	Thick bush & forests	0
Flat areas	60	Permeable	60	Light bush & cultivated land	55
Hilly	35	Semi-permeable	10	Grasslands	40
Steep areas	5	Impermeable	5	Bare	5

Days on which thunder was heard = 70 days/year
Weather Services station number = 261367
Weather Services station location = BLOEMFONTEIN (ST MICHAELS)
Mean annual precipitation (MAP) = 536 mm

Duration	2	5	10	20	50	100	200
1 day	50	69	83	99	122	141	162
2 days	64	91	111	134	167	195	226
3 days	68	93	113	136	167	196	227
7 days	88	127	156	188	234	273	316

The modified recalibrated Herbfield relationship was used to determine point rainfall.

Average slope = 0.00415 m/m
Time of concentration = 2.97 h
Run-off factor
Rural - C1 = 0.275
Urban - C2 = 0.800
Lakes - C3 = 0.000
Combined - C = 0.422

Return period (years)	Time of concentration (hours)	Point rainfall (mm)	ARF (%)	Average intensity (mm)	Factor Ft	Runoff coefficient (%)	Peak flow (m³/s)
1:2	2.97	34.18	100.0	11.50	0.75	32.4	29.38
1:5	2.97	57.66	100.0	19.39	0.80	39.4	50.80
1:10	2.97	75.42	100.0	25.37	0.85	40.3	68.07
1:20	2.97	93.18	100.0	31.34	0.90	41.3	86.11
1:50	2.97	116.44	100.0	39.24	0.95	42.3	110.32
1:100	2.97	134.42	100.0	45.22	1.00	43.2	130.09
1:200	2.97	152.19	100.0	51.19	1.00	43.2	147.18

Run-off coefficient percentage includes adjustment saturation factors (Ft) for steep and impermeable catchments

Calculated using Utility Programs for Drainage 1.0.2

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Utility Programs for Drainage
Flood calculations

Sinotech

Project name: PORTION OF THE FARM KLIPFONTEIN 716 AND FARM CERES 626
Analysed by: Eben Terblanche
Name of river: Tributary To The Renoosterspruit
Description of site:
Filename: P:\2698 (Musgaung, Ptn of Klipfontein 716-RD and Ceres 636-RD)\Qsurf\Flood line\Run-Off\Run-Off 30 July 2019.fld
Date: 20 August 2019

Flood Frequency Analysis: Unit Hydrograph Method

Project	= PORTION OF THE FARM KLIPFONTEIN 716 AND FARM CERES 626
Analysed by	= Eben Terblanche
Name of river	= Tributary To The Renoosterspruit
Description of site	=
Date	= 20/08/2019
Area of catchment	= 23.361 km²
Length of longest watercourse	= 6.515 km
Height difference along equal area slope	= 27.0 m
Distance to catchment centroid	= 3.003 km
Veld type	= Region 4
Duration interval	= 5 minutes

Slope of longest stream	= 0.0041 m/m
Catchment index	= 303.8
Catchment lag	= 2.561
Coefficient (K0)	= 0.386 m³/s - hours/km²
Peak discharge of unit hydrograph (Qp)	= 3.610 m³/s

Return period = 1:2 year

Storm duration (minutes)	Point rainfall (mm)	Point intensity (mm/h)	ARF (%)	Average rainfall (mm)	Runoff factor (%)	Effective rain (mm)
5	8.6	103.1	90.9	7.8	6.0	0.47
10	13.2	79.4	93.5	11.4	8.6	0.97
15	15.6	62.2	94.5	14.7	10.5	1.55
20	18.1	54.2	95.2	17.2	11.9	2.05
25	20.0	48.1	95.8	19.2	13.0	2.49
30	21.6	43.2	96.2	20.8	13.8	2.87
35	23.0	39.4	96.5	22.2	14.5	3.23
40	24.1	36.1	96.8	23.3	15.0	3.50
45	25.1	33.4	97.1	24.3	15.5	3.77
50	25.9	31.1	97.3	25.2	15.9	4.01
55	26.7	29.2	97.4	26.0	16.2	4.22
60	27.4	27.4	97.6	26.8	16.5	4.42
65	28.0	25.9	97.7	27.4	16.8	4.60
70	28.6	24.5	97.8	28.0	17.0	4.77
75	29.1	23.3	97.9	28.5	17.3	4.93
80	29.6	22.2	98.0	29.0	17.5	5.07
85	30.1	21.2	98.1	29.5	17.7	5.21
90	30.5	20.3	98.2	29.9	17.8	5.34
95	30.9	19.5	98.3	30.3	18.0	5.46
100	31.2	18.7	98.3	30.7	18.1	5.57
105	31.6	18.1	98.4	31.1	18.3	5.68
110	31.9	17.4	98.5	31.4	18.4	5.79
115	32.2	16.8	98.5	31.8	18.5	5.88
120	32.5	16.3	98.6	32.1	18.7	5.98
125	32.8	15.7	98.6	32.3	18.8	6.07
130	33.1	15.3	98.7	32.6	18.9	6.16
135	33.3	14.8	98.7	32.9	19.0	6.24
140	33.6	14.4	98.7	33.1	19.1	6.32
145	33.8	14.0	98.8	33.4	19.2	6.39
150	34.0	13.6	98.8	33.6	19.2	6.47
155	34.2	13.3	98.8	33.8	19.3	6.54
160	34.5	12.9	98.9	34.1	19.4	6.61
165	34.7	12.6	98.9	34.3	19.5	6.67
170	34.8	12.3	98.9	34.5	19.6	6.74
175	35.0	12.0	98.9	34.7	19.6	6.80
180	35.2	11.7	99.0	34.8	19.7	6.86
185	35.4	11.5	99.0	35.0	19.8	6.92
190	35.6	11.2	99.0	35.2	19.8	6.98
195	35.7	11.0	99.0	35.4	19.9	7.03
200	35.9	10.8	99.1	35.5	19.9	7.09
205	36.0	10.5	99.1	35.7	20.0	7.14

2675	0.046	15.113
2680	0.046	15.090
2685	0.046	15.068
2690	0.046	15.045
2695	0.046	15.023
2700	0.046	15.001
2705	0.046	14.979
2710	0.046	14.956
2715	0.046	14.934
2720	0.045	14.912
2725	0.045	14.891
2730	0.045	14.869
2735	0.045	14.847
2740	0.045	14.825
2745	0.045	14.804
2750	0.045	14.782
2755	0.045	14.761
2760	0.045	14.739
2765	0.045	14.718
2770	0.045	14.697
2775	0.045	14.676
2780	0.044	14.655
2785	0.044	14.633
2790	0.044	14.612
2795	0.044	14.592
2800	0.044	14.571
2805	0.044	14.550
2810	0.044	14.529
2815	0.044	14.509
2820	0.044	14.488
2825	0.044	14.467
2830	0.044	14.447
2835	0.044	14.427
2840	0.044	14.406
2845	0.043	14.386
2850	0.043	14.366
2855	0.043	14.346
2860	0.043	14.326
2865	0.043	14.306
2870	0.043	14.286
2875	0.043	14.266
2880	0.043	14.246

Return period	Storm duration (minutes)	Peak discharge (m^3/s)
1:2 year	30	17.82
1:5 year	30	29.46
1:10 year	30	42.51
1:20 year	30	58.31
1:50 year	30	85.22
1:100 year	85	115.32

Calculated using Utility Programs for Drainage 1.0.2

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Utility Programs for Drainage
Flood calculations

Sinotech

Project name:	PORTION OF THE FARM KLIPFONTEIN 716 AND FARM CERES 626
Analysed by:	Eben Terblanche
Name of river:	Tributary To The Renosterspruit
Description of site:	
Filename:	P:\2698 (Mangaung, Ptn of Klipfontein 716-RD and Ceres 636-RD)\Qual\Flood line\Run-Off\Run-Off 30 July 2019.fld
Date:	20 August 2019

Flood Frequency analysis : Standard Design Flood method

Project name	= PORTION OF THE FARM KLIPFONTEIN 716 AND FARM CERES 626
Analysed by	= Eben Terblanche
Name of river	= Tributary To The Renosterspruit
Description of site	=
Date	= 20/08/2019
Catchment characteristics:	
Area of catchment	= 23.98102 km²
Length of longest watercourse	= 6.513 km
1085 height difference	= 27 m
Average slope	= 0.0055 m/m
Drainage basin characteristics:	
Drainage Basin number	= 9
Mean annual daily max rain	= 43 mm
Days on which thunder was heard	= 47 days
Runoff coefficient C2	= 15 %
Runoff coefficient C100	= 60 %
Basin mean annual precipitation	= 380 mm
Basin mean annual evaporation	= 1800 mm
Basin evaporation index MAE/MAP	= 4.74

RAINFALL DATA
The rainfall data in the table below are derived from two sources. The daily rainfall is from the Department of Water Affair's publication TR102 for the representative site. The modified Hershfield equation is used for durations up to four hours. Linear interpolation is used for values between 4 hours and one day.

Weather Services station 4c TR102 - 2568456 @ JACOBSDAL
Point mean annual precipitation = 380 mm

Dur:	RP =2	5	10	20	50	100	200
.25 h	14	33	36	37	47	54	61
.50 h	18	30	39	49	61	70	79
1 h	22	37	48	60	75	86	98
2 h	26	44	58	71	89	103	116
4 h	30	51	67	82	103	119	135
1 day	43	61	75	91	114	133	155
2 days	54	78	98	119	151	179	210
3 days	59	87	109	134	171	203	238
7 days	78	104	131	160	203	240	280

Runoff coefficients C2 = 15 % C100 = 60 %

Return period (years)	Time of concentration (hours)	Point precipitation (mm)	ARF (%)	Catchment precipitation (mm)	Runoff coefficient (%)	Peak flow (m³/s)
1:2	2.08	26.2	98.7	25.9	15.0	12.45
1:5	2.08	44.3	98.7	43.7	31.2	43.73
1:10	2.08	57.9	98.7	57.2	39.7	72.77
1:20	2.08	71.5	98.7	70.4	46.7	105.65
1:50	2.08	89.6	98.7	88.4	54.6	154.71
1:100	2.08	103.2	98.7	101.9	60.0	196.92
1:200	2.08	116.8	98.7	115.3	64.8	239.66

Calculated using Utility Programs for Drainage 1.0.2

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Utility Programs for Drainage
Flood calculations

Sinotech

Project name:	PORTION OF THE FARM KLIPFONTEIN 716 AND FARM CERES 626
Analysed by:	Eben Terblanche
Name of river:	Tributary To The Renoosterspruit
Description of site:	
Filename:	P:\2698 (Mangaung, Ptn of Klipfontein 716-BD and Ceres 636-BD)\Qsurf\Floodline\Run-Off\Rnn-Off 30 July 2019.fld
Date:	20 August 2019

Flood Frequency Analysis: Empirical Methods

Project	= PORTION OF THE FARM KLIPFONTEIN 716 AND FARM CERES 626
Analysed by	= Eben Terblanche
Name of river	= Tributary To The Renoosterspruit
Description of site	=
Date	= 20/08/2019
Area of catchment	= 23.951 km²
Length of longest watercourse	= 6.513 km
Height difference along equal-area slope	= 27.0 m
Distance to catchment centroid	= 3.003 km
Dolomitic area	= 0.0 %
Mean annual rainfall	= 561.0 mm
Veld type	= 4 & 5a
Kovács region	= R3 (K = 2.8)
Catchment parameter with regard to reaction time	= 0.079

Peak discharges by means of an empirical method developed by Midgley and Pitman

Return period (years)	KT constant	Peak flow (m³/s)
1:10	0.59	50.48
1:20	0.68	58.18
1:50	0.95	81.28
1:100	1.20	102.67

This MAF calculation includes a transition zone adjustment in the case of small catchments.

Regional maximum flood:	48.9	m³/s
Q50 (MAF):	21.85	m³/s (based on QT/QMAF relationship for Kovács regions)
Q100 (MAF):	29.51	m³/s (based on QT/QMAF relationship for Kovács regions)
Q200 (MAF):	39.30	m³/s (based on QT/QMAF relationship for Kovács regions)

The following equivalent maxima make no transition zone adjustments for small catchments.

Equivalent southern African maximum		
K-factor 5.6:	1322	m³/s
Equivalent world maxima		
K-factor 6.0:	2248	m³/s
K-factor 6.3:	3051	m³/s

Calculated using Utility Programs for Drainage 1.0.2

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ANNEXURE D

1:50 AND 1:100-YEAR FLOOD LINES

RE/2955

5171

5405

5236

5417

5406

5235

5234

5409

5401

5031

2389

5400

3442

5175

3441

5176

7603

3443

5174

5177

5178

7602

5/716

7601

7600

7599

7597

7596

ROAD R702

5702

RE/716

4/716

2/716

1/714

RAVENSWOOD 1611

BALQUHIDDER No 1967

MANGAUNG METROPOLITAN MUNICIPALITY

NGOTI

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Consulting Engineers

TOWNSHIP ESTABLISHMENT ON A PORTION OF THE FARM KLIPFONTEIN 716 AND THE FARM CERES 620

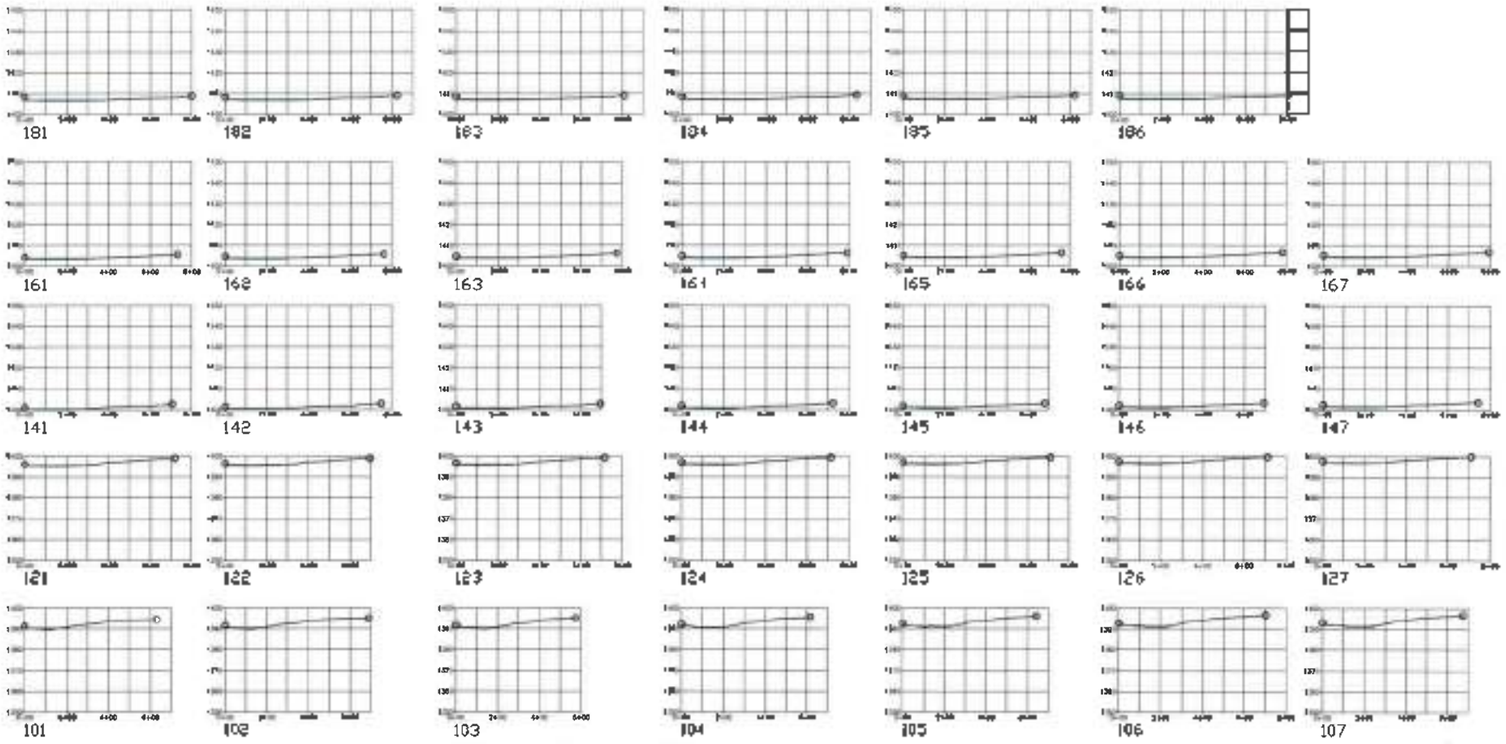
FLOODLINES
1:50 AND 1:100 YEAR FLOOD LINES

AUGUST 2019

1:5000

2698/120/01/00

2698/120/01/00



NOTES / NOTAS

REFERENCE / VERWYSINGS

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TOWNSHIP ESTABLISHMENT ON A PORTION OF THE FARM KLIPFONTEIN 716 AND THE FARM CERES 436

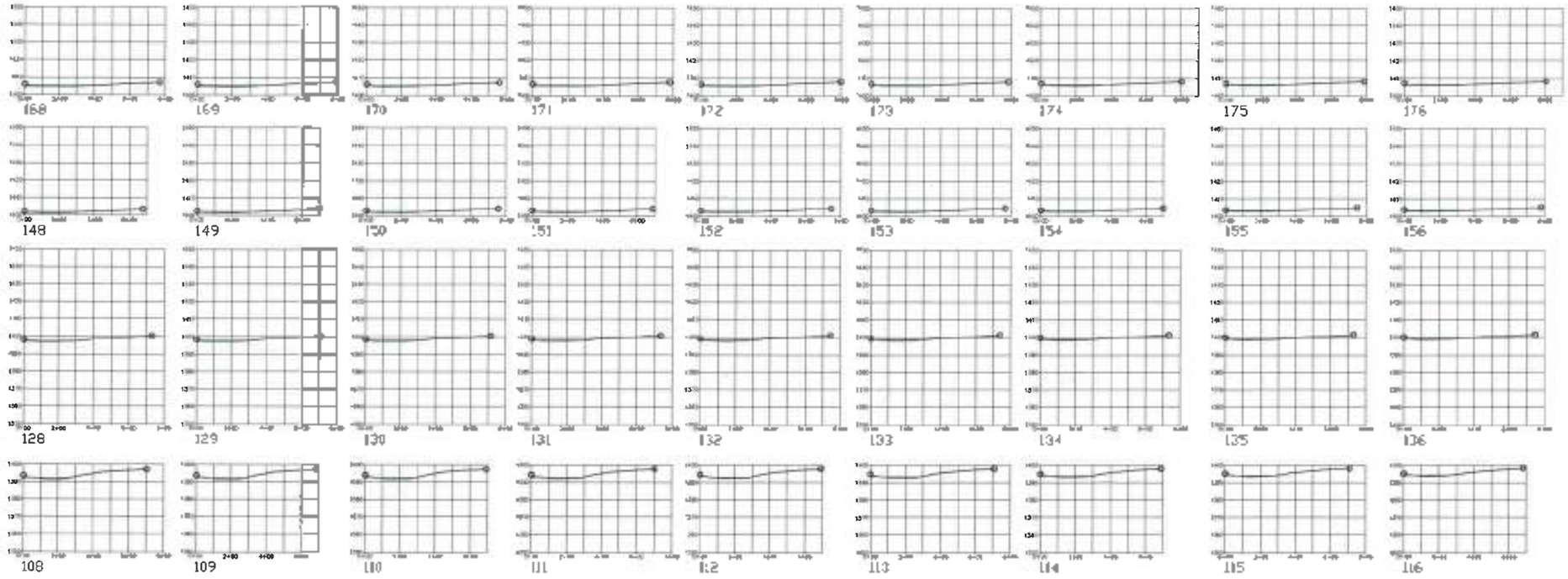
FLOODLINES
1:50 AND 1:100 YEAR FLOOD LINES
CROSS-SECTION DETAILS
SHEET 1 OF 5

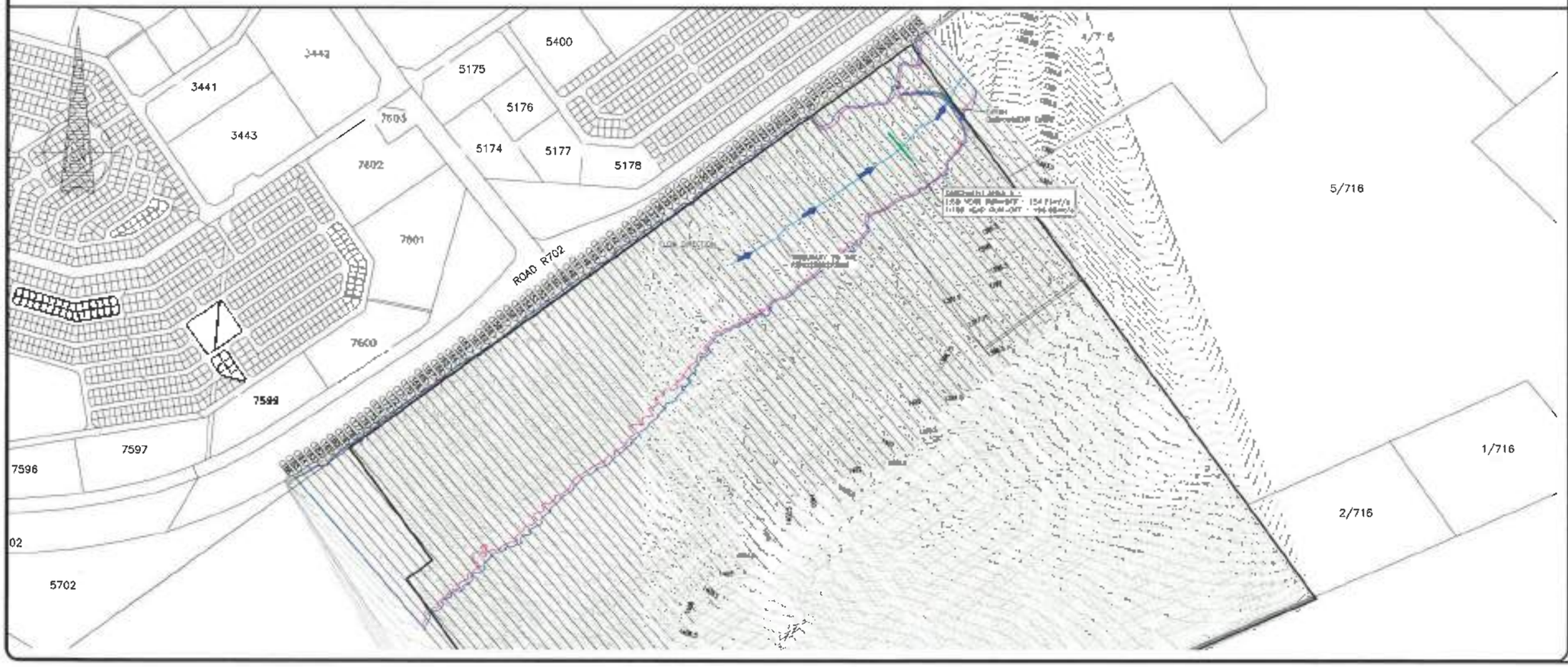
AUGUST 2019

1:5000

2698/121/01/00

2698/121/01/00





NOTES / NOTAS

AUTHORISED / GEMAGTIGDE

MANGAUNG METROPOLITAN MUNICIPALITY

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Consulting Engineers

TOWNSHIP ESTABLISHMENT ON A PORTION OF THE FARM KLIPFONTEIN 716 AND THE FARM CEDRUS 424

PEDESTRIANISED
1:10 AND 1:100 YEAR FLOOD LINES
CROSS-SECTION DETAILS
SHEET 2 OF 3

DATE : AUGUST 2019
DATUM:
SCALE : 1:1000
LEVEL :

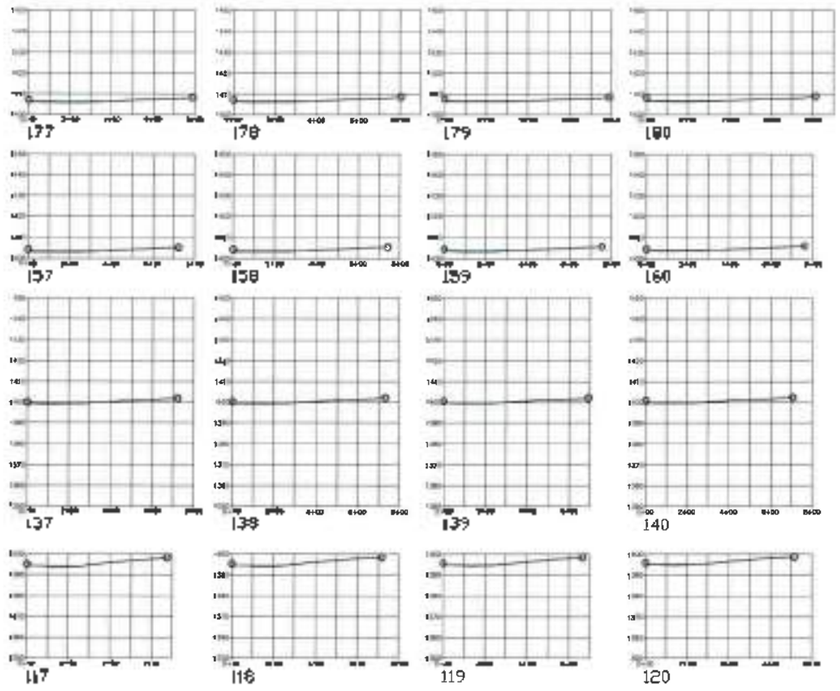
No.	DATE	DETAIL	AUTHORISED

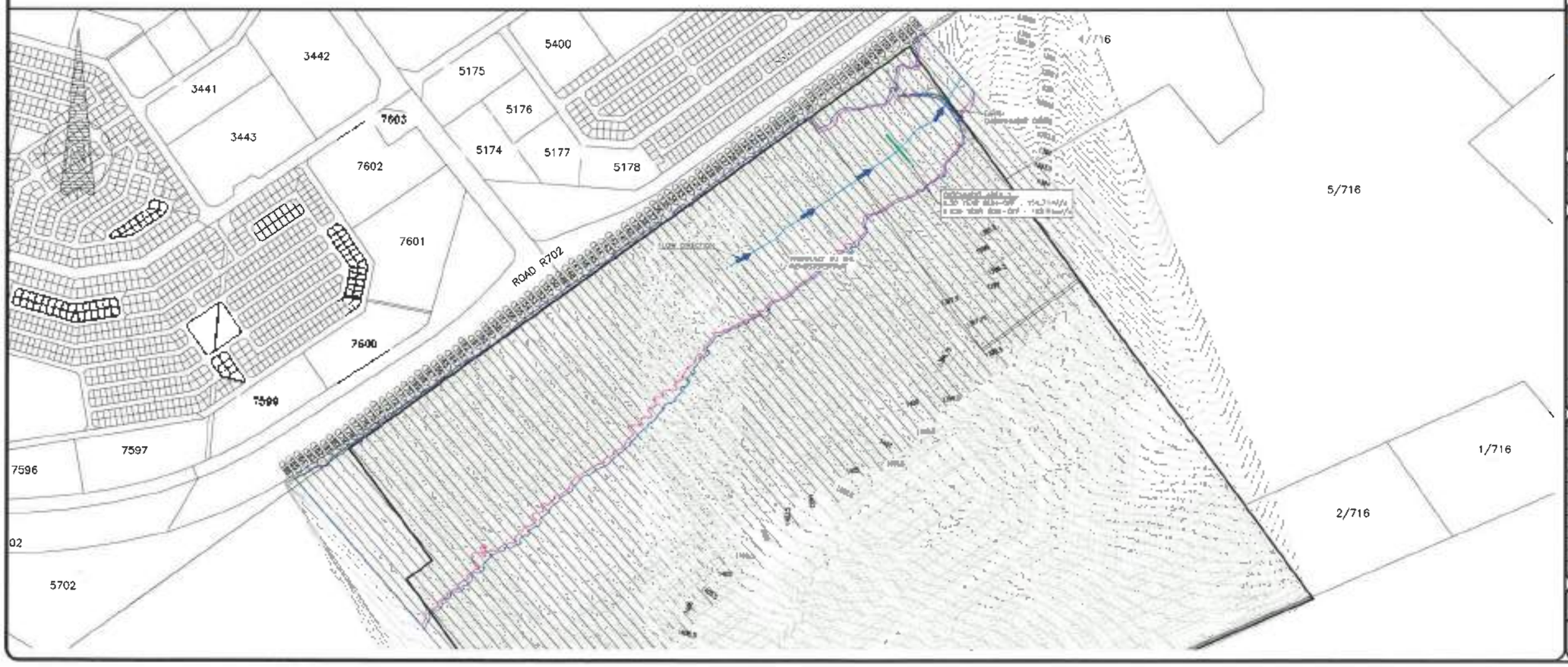
DRG. NO. / TEK. NR. 2698/121/02/00

FILE NO. / LêER NR.

CLIENT DRG. NO. / KLIËNT TEK. NR.

2698/121/02/00





NOTES / NOTAS

REFERENCE / VERWYSINGS

MANGAUNG METROPOLITAN MUNICIPALITY

NGOTI

CIVILCONSULT
Consulting Engineers

TOWNSHIP ESTABLISHMENT ON A PORTION OF THE FARM KLIPFONTEIN 716 AND THE FARM CEDRUS 620

FLOODLINES
1:50 AND 1:100 YEAR FLOOD LINES
CROSS-SECTION DETAILS
SHEET 3 OF 3

DATE: AUGUST 2019
SCALE: 1:3000

2698/121/03/00

2698/121/03/00

APPENDIX D3: HERITAGE IMPACT REPORT

G&A Heritage

Heritage Management Consultants

PROPOSED NEW TOWNSHIP DEVELOPMENT AT MANGAUNG

Heritage Impact Assessment (HIA) Report

July 2019

CREDIT SHEET

Stephan Gaigher (BA Hons, Archaeology, UP)

Principle Investigator for G&A Heritage Properties (Pty) Ltd.

Member of ASAPA (Site Director Status)

Cell: +27 73 752 6583

Email: stephan@gaheritage.co.za

REPORT AUTHOR

Stephan Gaigher

Disclaimer; *Although all possible care is taken to identify all sites of cultural importance during the investigation of study areas, it is always possible that hidden or sub-surface sites could be overlooked during the study. G&A Heritage and its personnel will not be held liable for such oversights or for costs incurred as a result of such oversights.*

Statement of Independence
As the duly appointed representative of G&A Heritage, I Stephan Gaigher, hereby confirm my independence as a specialist and declare that neither I nor G&A Heritage have any interests, be it business or otherwise, in any proposed activity, application or appeal in respect of which the Environmental Consultant was appointed as Environmental Assessment Practitioner, other than fair remuneration for work performed on this project.

SIGNED BY: STEPHAN GAIGHER

MANAGEMENT SUMMARY

Project Name and Location

Proposed New Township Development outside Bloemfontein in the Mangaung Metropolitan Municipality in the Free State Province.
Situated on a Portion of the Farm Klipfontein 716 and the Farm Ceres 626.

Consultant

G&A Heritage Management Properties (Pty) Ltd.
P.O. Box 522, Louis Trichardt, 0920
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Stephan Gaigher
+27 73 752 6583
stephan@gaheritage.co.za

Appointed by

Inaluk Consulting Services

Developer / Proponent

Ngoti Development Consultants

Client

Mangaung Metropolitan Municipality

Date of Report

19 July 2019

MANAGEMENT SUMMARY

The purpose of the management summary is to distil the information contained in the report into a format that can be used to give specific results quickly and facilitate management decisions. It is not the purpose of the management summary to repeat in shortened format all the information contained in the report, but rather to give a statement of results for decision making purposes.

This study focuses on the proposed new township development on a portion of the farm Klipfontein 716 and farm Ceres 626 near Bloemfontein in the Mangaung Metropolitan Municipality in the Free State Province.

This study encompasses the heritage impact investigation. A preliminary layout has been supplied to lead this phase of this study.

Scope of Work

A Heritage Impact Assessment (including Archaeological, Cultural heritage, Built Heritage and Basic Palaeontological Assessment to determine the impacts on heritage resources within the study area.

The following are the required to perform the assessment:

- A desk-top investigation of the area;
- A site visit to the proposed development site;
- Identify possible archaeological, cultural, historic, built and palaeontological sites within the proposed development area;
- Evaluate the potential impacts of construction and operation of the proposed development on archaeological, cultural, historical resources; built and palaeontological resources; and
- Recommend mitigation measures to ameliorate any negative impacts on areas of archaeological, cultural, historical, built and palaeontological importance.

The purpose of this study is to determine the possible occurrence of sites with cultural heritage significance within the study area. The study is based on archival and document combined with fieldwork investigations.

Findings and Recommendations

The area was investigated during a field visit and through archival studies. The site was found to be devoid of any heritage sites with significance.

Some modern ruins were observed within the study area. These hold no heritage value and have been documented photographically.

It is recommended that obscured, subterranean sites be managed, if they are encountered.

The area is indicated as *Very High Importance* on the SAHRIS Paleo Sensitivity Map. A field assessment and protocol for finds is required.

Fatal Flaws

No fatal flaws were identified.

CONTENTS

List of Figures

List of Tables

ABBREVIATIONS

Abbreviation	Meaning
BP	Before Present
c.	circa
BCE	Before the Common Era
Bp	Before Present
CE	Common Era
EIA	Early Iron Age
ESA	Early Stone Age
Fm	Femtometre (10^{-15}m)
GPS	Geographic Positioning System
HIA	Heritage Impact Assessment
LIA	Late Iron Age
LSA	Late Stone Age
MSA	Middle Stone Age
MYA	Million Years Ago
NHRA	National Heritage Resources Agency
OFS	Orange Free State
PIA	Palaeontological Impact Assessment
SAHRA	South African Heritage Resource Agency
SAHRIS	South African Heritage Information System
SANNC	South African Native National Congress
S&EIR	Scoping and Environmental Impact Reporting
Um	Micrometre (10^{-6}m)
WGS 84	World Geodetic System for 1984

GLOSSARY OF TERMS

'**Archaeological**' means:

a) Material remains resulting from human activity which are in a state of disuse and are in or on land and are older than 100 years, including artefacts, human and hominid remains and artificial features and structures;
b) Rock art, being a form of painting, engraving or other graphic representation on a fixed rock surface or loose rock or stone, which was executed by human agency and is older than 100 years including any area within 10 m of such representation; and
c) Wrecks, being any vessel or aircraft, or any part thereof, which was wrecked in South Africa, whether on land or in the maritime cultural zone referred to in section 5 of the Maritime Zones Act 1994 (Act 15 of 1994), and any cargo, debris or artefacts found or associated therewith, which are older than 60 years or which in terms of national legislation are considered to be worthy of conservation;
d) Features, structures and artefacts associated with military history which are older than 75 years and the sites on which they are found.

'**Circa**' is used in front of a particular year to indicate an approximate date.

'Grave' means a place of interment and includes the contents, headstone or other marker of and any other structures on or associated with such place. The South African Heritage Resources Agency (SAHRA) will only issue a permit for the alteration of a grave if it is satisfied that every reasonable effort has been made to contact and obtain permission from the families concerned.

'Paleontological' means any fossilised remains or fossil trace of animals or plants which lived in the geological past, other than fossil fuels or fossiliferous rock intended for industrial use, and any site which contains such fossilised remains or trace.

A '**place**' is defined as:

a) A site, area or region;
b) A building or other structure (which may include equipment, furniture, fittings and articles associated with or connected with such building or other structure);
c) A group of buildings or other structures (which may include equipment, furniture, fittings and articles associated with or connected with such group of buildings or other structures); and (d) an open space, including a public square, street or park; and in relation to the management of a place, includes the immediate surroundings of a place.

'**Structures**' means any building, works, device, or other facility made by people and which is fixed to land and any fixtures, fittings and equipment associated therewith older than 60 years.

1. General

1.1 Project Description

G&A Heritage was appointed by Inaluk Consulting Services to undertake a Heritage Impact Assessment (HIA) for the proposed new township development on a portion of the farm Klipfontein 716 and farm Ceres 626 near Bloemfontein in the Mangaung Metropolitan Municipality in the Free State Province.

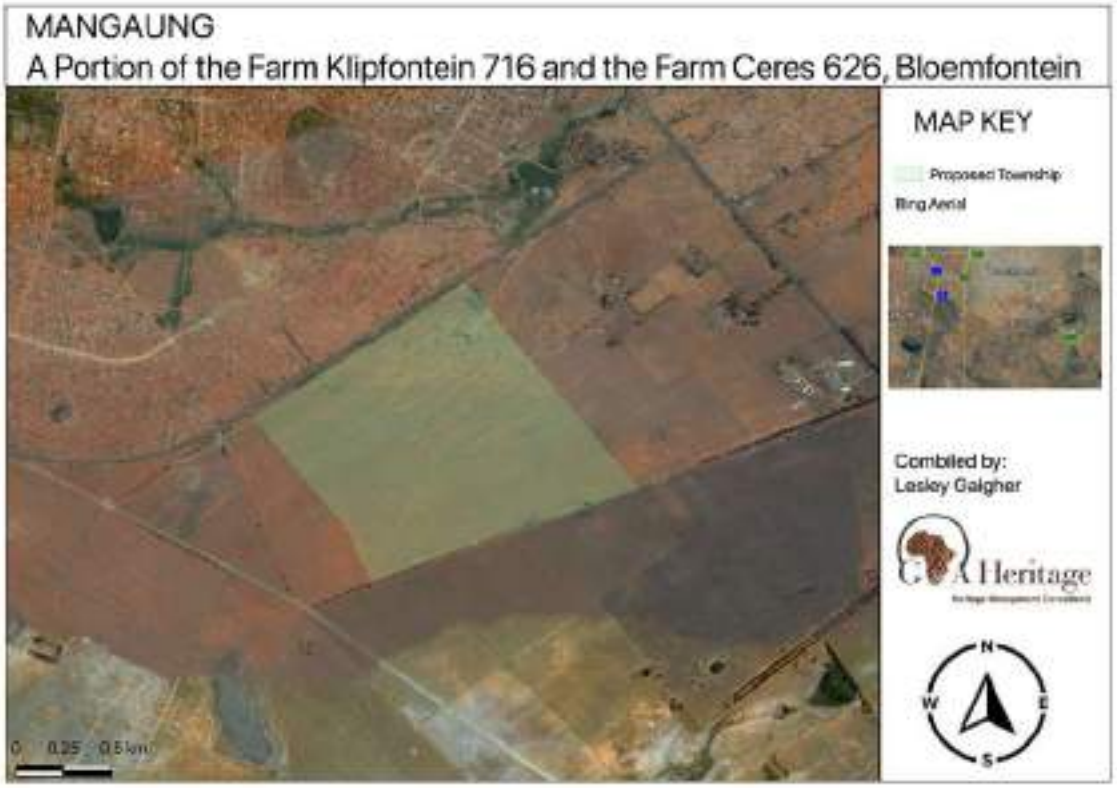

Figure 1. Proposed new township development in Mangaung Metro Municipality

1.2 Technical Scope of HIA

This HIA focused only on the area to be directly affected by the proposed development. The study area is 192.9 Ha in extent.

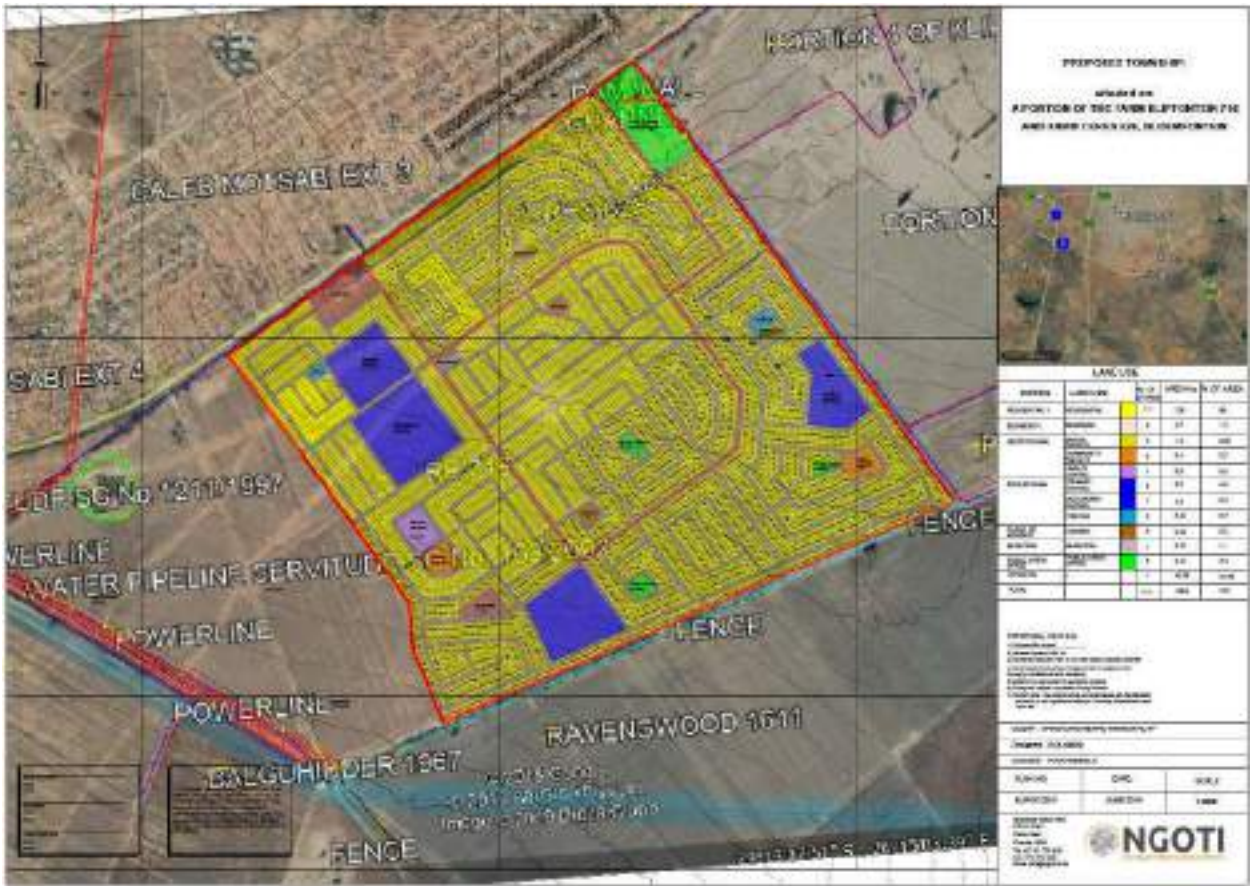

Figure 2. Proposed layout of the new township

The HIA is meant to deliver, evaluate and inform on the following aspects:

(a) The identification and mapping of all heritage resources in the area affected;
(b) An assessment of the significance of such resources in terms of the heritage assessment criteria set out in the relevant legal descriptions, development proponent requirements and as per international best practise approaches and charters;
(c) An assessment of the impact of the development on such heritage resources;
(d) An evaluation of the impact of the development on heritage resources relative to the sustainable social and economic benefits to be derived from the development;
(e) The results of consultation with communities affected by the proposed development and other interested parties regarding the impact of the development on heritage resources;
(f) If heritage resources will be adversely affected by the proposed development, the consideration of alternatives; and
(g) Plans for mitigation of any adverse effects during and after the completion of the proposed development.

The following categories of heritage objects are considered.

Graves: Places of interment including the contents, headstone or other marker of and any other structures on or associated with such place. This may include any of the following:

1) Ancestral graves,
2) Royal graves and graves of traditional leaders
3) Graves of victims of conflict i.e. graves of important individuals
4) Historical graves and cemeteries older than 60 years
5) Other human remains, buried or otherwise.

The removal of graves is subject to the following procedures:

- Notification of the impending removals (using local language media and notices at the grave site);
- Consultation with individuals or communities related or known to the deceased;
- Satisfactory arrangements for the curation of human remains and / or headstones in a museum, where applicable;
- Procurement of a permit from the relevant controlling body;
- Appropriate arrangements for the exhumation (preferably by a suitably trained archaeologist) and re-interment (sometimes by a registered undertaker, in a formally proclaimed cemetery);
- Observation of rituals or ceremonies required by the families.

Movable objects: This includes objects such as historic or rare books and manuscripts, paintings, drawings, sculptures, statuettes and carvings; modern or historic religious items; historic costumes, jewellery and textiles; fragments of monuments or historic buildings; archaeological material; and natural history collections such as shells, flora, or minerals. Discoveries and access resulting from a project may increase the vulnerability of cultural objects to theft, trafficking or abuse. This may include any of the following:

1) Objects recovered from the soil or water including archaeological and paleontological objects and material, meteorites and rare geological specimens;
2) Ethnographic art and objects
3) Military objects
4) Objects of decorative art
5) Objects of fine art
6) Objects of scientific or technological interest
7) Books, records, documents, photographic positives and negatives, graphic, film or video material or sound recordings
8) Any other prescribed categories, but excluding any object made by a living person.

Protection of Historic Battlefields

Heritage "Places": A 'place' is defined as:

a) A site, area or region;
b) A building or other structure (which may include equipment, furniture, fittings and articles associated with or connected with such building or other structure);
c) A group of buildings or other structures (which may include equipment, furniture, fittings and articles associated with or connected with such group of buildings or other structures); and
d) An open space, including a public square, street or park; and in relation to the management of a place, includes the immediate surroundings of a place.
e) Traditional Buildings used in cultural ceremonies.

Heritage Structures: Refers to single or groups of architectural works found in urban or rural settings providing evidence of a particular civilisation, a significant development or a historic event. It includes groups of buildings, structures and open spaces constituting past or contemporary human settlements that are recognised as cohesive and valuable from an architectural, aesthetic, spiritual or socio-cultural perspective.
This may also include any building, works, device, or other facility made by people and which is fixed to land and any fixtures, fittings and equipment associated therewith older than 60 years.

Archaeological Sites
Archaeological sites comprise any combination of structural remains, artefacts, human or ecological elements and may be located entirely beneath, partially above, or entirely above the land or water surface. Archaeological material may be found anywhere on the earth's surface, singly or scattered over large areas. Such material includes burial areas, human remains, artefacts and fossils. Archaeological sites may include:

a) Material remains resulting from human activity which are in a state of disuse and are in or on land and are older than 100 years, including artefacts, human and hominid remains and artificial features and structures;
b) Rock art, being a form of painting, engraving or other graphic representation on a fixed rock surface or loose rock or stone, which was executed by human agency and is older than 100 years including any area within 10 m of such representation; and
c) Wrecks, being any vessel or aircraft, or any part thereof, which was wrecked, whether on land or in the maritime cultural zone, and any cargo, debris or artefacts found or associated therewith, which are older than 60 years or which in terms of national legislation are considered to be worthy of conservation;
d) Features, structures and artefacts associated with military history which are older than 75 years and the sites on which they are found.

Paleontological resources: Refers to any fossilised remains or fossil trace of animals or plants which lived in the geological past, other than fossil fuels or fossiliferous rock intended for industrial use, and any site which contains such fossilised remains or trace.

Sacred or Spiritual Sites: Refers to natural features with cultural significance, which may include sacred hills, mountains, landscapes, streams, rivers, waterfalls, caves and rocks; sacred trees or plants, groves and forests; carvings or paintings on exposed rock faces or in caves; and paleontological deposits of early human, animal or fossilised remains. This heritage may have significance to local community groups or minority populations.

1.3 Geographical / Spatial Scope of HIA

The geographic and spatial scope of the HIA centres on the proposed new township development on a portion of the farm Klipfontein 716 and farm Ceres 626, near Bloemfontein in the Mangaung Metropolitan Municipality. Any sites within the directly impacted study area that can be affected by the proposed development and, where known, are included in this report. Mitigation or secondary investigations take this footprint as the spatial parameters of the study area.

1.4 GPS Track Path

The investigation was across the span of the study area. GPX Files are available.

Figure 3. Track Path

1.5 Temporal Scope

The proposed project will consist of three phases;

1) Planning
2) Development
3) Operational

Due to the nature of the proposed development impacts on heritage sites are only anticipated during the development phase of the proposed project. The operational phase will not result in any further alterations to heritage on any significant scale and at present there is still no defined decommissioning phase.

2. Legislative Context

2.1 National Legislation

Section 38(1) of the South African Heritage Resources Act (25 of 1999) requires that a heritage study is undertaken for:

(a) Construction of a road, wall, power line, pipeline, canal or other similar form of linear development or barrier exceeding 300 m in length;
(b) Construction of a bridge or similar structure exceeding 50 m in length; and
(c) Any development, or other activity which will change the character of an area of land, or water –
(1) Exceeding 10 000 m^2 in extent;
(2) Involving three or more existing erven or subdivisions thereof; or
(3) Involving three or more erven, or subdivisions thereof, which have been consolidated within the past five years; or
(d) The costs of which will exceed a sum set in terms of regulations; or
(e) Any other category of development provided for in regulations.

While the above describes the parameters of developments that fall under this Act., Section 38 (8) of the NHRA is applicable to this development. This section states that;

(8) *The provisions of this section do not apply to a development as described in subsection (1) if an evaluation of the impact of such development on heritage resources is required in terms of the Environment Conservation Act, 1989 (Act 73 of 1989), or the integrated environmental management guidelines issued by the Department of Environment Affairs and Tourism, or the Minerals Act, 1991 (Act 50 of 1991), or any other legislation: Provided that the consenting authority must ensure that the evaluation fulfils the requirements of the relevant heritage resources authority in terms of subsection (3), and any comments and recommendations of the relevant heritage resources authority with regard to such development have been taken into account prior to the granting of the consent.*

In regard to a development such as this that falls under Section 38 (8) of the NHRA, the requirements of Section 38 (3) applies to the subsequent reporting, stating that;

(3) The responsible heritage resources authority must specify the information to be provided in a report required in terms of subsection (2) (a): Provided that the following must be included:
(a) The identification and mapping of all heritage resources in the area affected;
(b) An assessment of the significance of such resources in terms of the heritage assessment criteria set out in section 6 (2) or prescribed under section 7;
(c) An assessment of the impact of the development on such heritage resources;
(d) An evaluation of the impact of the development on heritage resources relative to the sustainable social and economic benefits to be derived from the development;
(e) The results of consultation with communities affected by the proposed development and other interested parties regarding the impact of the development on heritage resources;
(f) If heritage resources will be adversely affected by the proposed development, the consideration of alternatives; and
(g) Plans for mitigation of any adverse effects during and after the completion of the proposed development.
(1) Ancestral graves,
(2) Royal graves and graves of traditional leaders,
(3) Graves of victims of conflict (iv) graves of important individuals,
(4) Historical graves and cemeteries older than 60 years, and
(5) Other human remains which are not covered under the Human Tissues Act, 1983 (Act No.65 of 1983 as amended);
(h) Movable objects, including ;

(1) Objects recovered from the soil or waters of South Africa including archaeological and paleontological objects and material, meteorites and rare geological specimens;
(2) Ethnographic art and objects;
(3) Military objects;
(4) Objects of decorative art;
(5) Objects of fine art;
(6) Objects of scientific or technological interest;
(7) Books, records, documents, photographic positives and negatives, graphic, film or video material or sound recordings; and
(8) Any other prescribed categories, but excluding any object made by a living person;

(i) Battlefields;
(j) Traditional building techniques.

A '**place**' is defined as:

a) A site, area or region;
b) A building or other structure (which may include equipment, furniture, fittings and articles associated with or connected with such building or other structure);
c) A group of buildings or other structures (which may include equipment, furniture, fittings and articles associated with or connected with such group of buildings or other structures); and (d) an open space, including a public square, street or park; and in relation to the management of a place, includes the immediate surroundings of a place.

'**Structures**' means any building, works, device, or other facility made by people and which is fixed to land and any fixtures, fittings and equipment associated therewith older than 60 years.

'**Archaeological**' means:

a) Material remains resulting from human activity which are in a state of disuse and are in or on land and are older than 100 years, including artefacts, human and hominid remains and artificial features and structures;
b) Rock art, being a form of painting, engraving or other graphic representation on a fixed rock surface or loose rock or stone, which was executed by human agency and is older than 100 years including any area within 10 m of such representation; and
c) Wrecks, being any vessel or aircraft, or any part thereof, which was wrecked in South Africa, whether on land or in the maritime cultural zone referred to in section 5 of the Maritime Zones Act 1994 (Act 15 of 1994), and any cargo, debris or artefacts found or associated therewith, which are older than 60 years or which in terms of national legislation are considered to be worthy of conservation;
d) Features, structures and artefacts associated with military history which are older than 75 years and the sites on which they are found.

'Paleontological' means any fossilised remains or fossil trace of animals or plants which lived in the geological past, other than fossil fuels or fossiliferous rock intended for industrial use, and any site which contains such fossilised remains or trace.

'Grave' means a place of interment and includes the contents, headstone or other marker of and any other structures on or associated with such place. The South African Heritage Resources Agency (SAHRA) will only issue a permit for the alteration of a grave if it is satisfied that every reasonable effort has been made to contact and obtain permission from the families concerned.

The removal of graves is subject to the following procedures as outlined by the SAHRA:

- Notification of the impending removals (using English, Afrikaans and local language media and notices at the grave site);
- Consultation with individuals or communities related or known to the deceased;
- Satisfactory arrangements for the curation of human remains and / or headstones in a museum, where applicable;
- Procurement of a permit from the SAHRA;

- Appropriate arrangements for the exhumation (preferably by a suitably trained archaeologist) and re-interment (sometimes by a registered undertaker, in a formally proclaimed cemetery);
- Observation of rituals or ceremonies required by the families.

The limitations and assumptions associated with this heritage impact assessment are as follows;

- Field investigations were performed on foot and by vehicle where access was readily available.
- Sites were evaluated by means of description of the cultural landscape, direct observations and analysis of written sources and available databases.
- It was assumed that the site layout as provided by *Inaluk Consulting Services* is accurate.
- We assumed that the public participation process performed as part of the Basic Assessment process was sufficiently encompassing not to be repeated in the Heritage Assessment Phase.

Table 1. Impacts on the NHRA Sections

Act	Section	Description	Possible Impact	Action
National Heritage Resources Act (NHRA)	34	Preservation of buildings older than 60 years	No impact	None
	35	Archaeological, paleontological and meteor sites	No impact	None
	36	Graves and burial sites	No impact	None
	37	Protection of public monuments	No impact	None
	38	Does activity trigger a HIA?	Yes	HIA

Table 2. NHRA Triggers

Action Trigger	Yes/No	Description
Construction of a road, wall, power line, pipeline, canal or other linear form of development or barrier exceeding 300m in length.	No	N/A
Construction of a bridge or similar structure exceeding 50m in length.	No	N/A
Development exceeding 5000 m^2	Yes	Proposed new township development
Development involving more than 3 erven or sub divisions	No	N/A
Development involving more than 3 erven or sub divisions that have been consolidated in the past 5 years	No	N/A
Re-zoning of site exceeding 10 000 m^2	Yes	Proposed new township development
Any other development category, public open space, squares, parks or recreational grounds	No	N/A

3. Methodology

3.1 Heritage Management

This study defines the heritage component of the EIA process being undertaken for the proposed new township development on a portion of the farm Klipfontein 716 and the farm Ceres 626 near Bloemfontein in the Mangaung Metropolitan Municipality in the Free State Province.

It is described as a first phase (HIA). This report attempts to evaluate both the accumulated heritage knowledge of the area and information derived from direct physical observations.

3.2 Inventory

Inventory studies involve the in-field survey and recording of archaeological resources within a proposed development area. The nature and scope of this type of study is defined primarily by the results of the overview study. In the case of site-specific developments, direct implementation of an inventory study may preclude the need for an overview.

There are a number of different methodological approaches to conducting inventory studies. Therefore, the proponent, in collaboration with the archaeological consultant, must develop an inventory plan for review and approval by the SAHRA prior to implementation (*Dincause, Dena F., H. Martin Wobst, Robert J. Hasenstab and David M. Lacy 1984)*.

3.3 Evaluating Heritage Impacts

A combination of document research as well as the determination of the geographic suitability of areas and the evaluation of aerial photographs determined which areas could and should be accessed.

After plotting of the site on a GPS the areas were accessed using suitable combinations of vehicle access and access by foot.

Sites were documented by digital photography and geo-located with GPS readings using the WGS 84 datum. An aerial drone was used to evaluate the site from different heights and to improve coverage of the area.

Further techniques (where possible) included interviews with local inhabitants, visiting local museums and information centers and discussions with local experts. All this information was combined with information from an extensive literature study as well as the result of archival studies based on the SAHRA (South African Heritage Resource Agency) provincial databases.

This Heritage Impact Assessment relies on the analysis of written documents, maps, aerial photographs and other archival sources combined with the results of site investigations and interviews with effected people. Site investigations are not exhaustive and often focus on areas such as river confluence areas, elevated sites or occupational ruins.

The following documents were consulted in this study;

- South African National Archive Documents
- SAHRIS (South African Heritage Resources Information System) Database of Heritage Studies
- Internet Search
- Historic Maps
- 1951 and 2007 Surveyor General Topographic Map series
- 1952 1:10 000 aerial photo survey
- Google Earth 2018 imagery
- Published articles and books
- JSTOR Article Archive

3.4 Site Visit / Fieldwork Details

Fieldwork for the HIA was done on the 17th and 18th of July 2019. Most of the areas were found to be accessible by vehicle and on foot. Areas of possible significance were investigated on foot. The survey was tracked using GPS and a track file in GPX format is available on request. An aerial drone was used to increase coverage of the site. It has been found that high resolution aerial photography is much more effective than transect walks (which is usually prohibitively expensive in terms of time and cost). A meshed image of the site is compiled from a mosaic of photos taken from a height of 60m. This gives a resolution of 2cm/pixel. These photographs were compiled on site, analysed and anomalous areas investigated on foot.

Where sites were identified it was documented photographically and plotted using GPS with the WGS 84 datum point as reference. GPX files are available on request from G&A Heritage.

The study area was surveyed using standard archaeological surveying methods. The area was surveyed using directional parameters supplied by the GPS and surveyed by foot and aerial drone. This technique has proven to result in the maximum coverage of an area.

Standard archaeological documentation formats were employed in the description of sites. Using standard site documentation forms as comparable medium, it enabled the surveyors to evaluate the relative importance of sites found. Furthermore, GPS (Global Positioning System) readings of all finds and sites were taken. This information was then plotted using a ***Garmin Colorado*** GPS (WGS 84- datum).

Indicators such as surface finds, plant growth anomalies, local information and topography were used in identifying sites of possible archaeological importance. Test probes were done at intervals to determine sub-surface occurrence of archaeological material. The importance of sites was assessed by comparisons with published information as well as comparative collections.

Test excavation is that form of archaeological excavation where the purpose is to establish the nature and extent of archaeological deposits and features present in a location, which it is proposed to develop (though not normally to fully investigate those deposits or features) and allow an assessment to be made of the archaeological impact of the proposed development. It may also be referred to as archaeological testing' (DAHGI 1999a, 27).

'Test excavation should not be confused with, or referred to as, archaeological assessment which is the overall process of assessing the archaeological impact of development. Test excavation is one of the techniques in carrying out archaeological assessment which may also include, as appropriate, documentary research, field walking, examination of upstanding or visible features or structures, examination of aerial photographs, satellite or other remote sensing imagery, geophysical survey, and topographical assessment' (DAHGI 1999b, 18).

3.5 Findings

A water cistern, troughs and other modern ruins in the centre of the study area were noted. More modern ruins along the southern boundary of the study area was also identified. None of these are considered to be historically significant.

3.6 Consultations

Signage indicating the HIA performed and the planned development actions were placed on site. The heritage component was also included in the larger ESIA advertisements placed by the lead consultant. Since the site is not occupied and bordered by the informal settlements and commercial farming, it is not anticipated that any public participation feedback will be received. It was noted that the site is used by a local farmers as grazing for their sheep. It is not known if this is a formal arrangement.

3.7 Assumptions

It was assumed that the impacted areas will be limited to the proposed layout as received by *Inaluk Consulting Services*. It is furthermore assumed that the Paleo Sensitivity Map provided on the SAHRIS platform is comprehensive enough to inform on actions in this regard. It is assumed that activities will be limited to the development area and that they will not impact any areas outside of the indicated study area.

3.8 Gaps / Limitations / Uncertainty

The area was readily accessible.

3.9 Specialist Specific Methodology

The scope of work includes:

- the identification and assessment of archaeological, cultural, historic, built and paleontological sites within the study area.
- Interrogation of project-specific Drone data and aerial imagery.
- Archival study of existing data and information for the study area.
- This site work includes communicating with local inhabitants to confirm possible locations of heritage and cultural sites.
- Impact assessment has been performed according to the methodology as described in the relevant section.

3.10 Impact Assessment Methodology

Degrees of Significance – Significance Criteria

There are several kinds of significance, including scientific, public, ethnic, historic and economic, that need to be taken into account when evaluating heritage resources. For any site, explicit criteria are used to measure these values. Checklists of criteria for evaluating pre-contact and post-contact archaeological sites are provided. These checklists are not intended to be exhaustive or inflexible. Innovative approaches to site evaluation which emphasize quantitative analysis and objectivity are encouraged. The process used to derive a measure of relative site significance must be rigorously documented, particularly the system for ranking or weighting various evaluated criteria.

Site integrity, or the degree to which a heritage site has been impaired or disturbed as a result of past land alteration, is an important consideration in evaluating site significance. In this regard, it is important to recognize that although an archaeological site has been disturbed, it may still contain important scientific information.

Heritage resources may be of scientific value in two respects. The potential to yield information, which, if properly recovered, will enhance understanding of Southern African human history, is one appropriate measure of scientific significance. In this respect, archaeological sites should be evaluated in terms of their potential to resolve current archaeological research problems. Scientific significance also refers to the potential for relevant contributions to other academic disciplines or to industry.

Public significance refers to the potential a site has for enhancing the public's understanding and appreciation of the past. The interpretive, educational and recreational potential of a site are valid indications of public value. Public significance criteria such as ease of access, land ownership, or scenic setting are often external to the site itself. The relevance of heritage resource data to private industry may also be interpreted as a particular kind of public significance.

Ethnic significance applies to heritage sites which have value to an ethnically distinct community or group of people. Determining the ethnic significance of an archaeological site may require consultation with persons having special knowledge of a particular site. It is essential that ethnic significance be assessed by someone properly trained in obtaining and evaluating such data.

Historic archaeological sites may relate to individuals or events that made an important, lasting contribution to the development of a particular locality or the province. Historically important sites also reflect or

commemorate the historic socioeconomic character of an area. Sites having high historical value will also usually have high public value.

The economic or monetary value of a heritage site, where calculable, is also an important indication of significance. In some cases, it may be possible to project monetary benefits derived from the public's use of a heritage site as an educational or recreational facility. This may be accomplished by employing established economic evaluation methods; most of which have been developed for valuating outdoor recreation. The objective is to determine the willingness of users, including local residents and tourists, to pay for the experiences or services the site provides even though no payment is presently being made. Calculation of user benefits will normally require some study of the visitor population *(Smith, L.D. 1977)*.

- **Rarity**
  - It possesses uncommon, rare or endangered aspects of natural or cultural heritage.
  - Importance for rare, endangered or uncommon structures, landscapes or phenomena.

- **Representivity**
  - It is important in demonstrating the principal characteristics of a particular class of natural or cultural places or objects.
  - Importance in demonstrating the principal characteristics of a range of landscapes or environments, the attributes of which identify it as being characteristic of its class.
  - Importance in demonstrating the principal characteristics of human activities (including way of life, philosophy, custom, process, land-use, function, design or technique) in the environment of the nation, province, region or locality.

The table below illustrates how a site's heritage significance is determined

Table 3. Site's Heritage Significance

Spheres of Significance	High	Medium	Low
International			
National			
Provincial			
Regional			
Local			
Specific Community			

4. Assessment of Heritage Potential

4.1 Assessment Matrix

4.1.1 Determining Archaeological Significance

In addition to guidelines provided by the National Heritage Resources Act (Act No. 25 of 1999), a set of criteria based on Deacon (J) and Whitelaw (1997) for assessing archaeological significance has been developed for Eastern Cape settings (Morris 2007a). These criteria include estimation of landform potential (in terms of its capacity to contain archaeological traces) and assessing the value to any archaeological traces (in terms of their attributes or their capacity to be construed as evidence, given that evidence is not given but constructed by the investigator).

Estimating site potential

Table 4 (below) is a classification of landforms and visible archaeological traces used for estimating the potential of archaeological sites (after J. Deacon and, National Monuments Council). Type 3 sites tend to be those with higher archaeological potential, but there are notable exceptions to this rule, for example the renowned rock engravings site Driekopseiland near Kimberley which is on landform L1 Type 1 – normally a setting of lowest expected potential. It should also be noted that, generally, the older a site the poorer the preservation, so that sometimes any trace, even of only Type 1 quality, could be of exceptional significance. In light of this, estimation of potential will always be a matter for archaeological observation and interpretation.

Table 4. Classification of landforms and visible archaeological traces for estimating the potential for archaeological sites (after J. Deaon, NMC as used in Morris)

Class	Landform	Type 1	Type 2	Type 3
L1	Rocky Surface	Bedrock exposed	Some soil patches	Sandy/grassy patches
L2	Ploughed land	Far from water	In floodplain	On old river terrace
L3	Sandy ground, inland	Far from water	In floodplain or near features such as hill/dune	On old river terrace
L4	Sandy ground, coastal	>1 km from sea	Inland of dune cordon	Near rocky shore
L5	Water-logged deposit	Heavily vegetated	Running water	Sedimentary basin
L6	Developed urban	Heavily built-up with no known record of early settlement	Known early settlement, but buildings have basements	Buildings without extensive basements over known historical sites
L7	Lime/dolomite	>5 myrs	<5000 yrs	Between 5000 yrs and 5 myrs
L8	Rock shelter	Rocky floor	Loping floor or small area	Flat floor, high ceiling
Class	Archaeological traces	Type 1	Type 2	Type 3
A1	Area previously excavated	Little deposit remaining	More than half deposit remaining	High profile site
A2	Shell of bones visible	Dispersed scatter	Deposit <0.5 m thick	Deposit >0.5 m thick; shell and bone dense
A3	Stone artefacts or stone walling or other feature visible	Dispersed scatter	Deposit <0.5m thick	Deposit >0.5 m thick

Table 5. Site attributes and value assessment (adopted from Whitelaw 1997 as used in Morris)

Class	Landforms	Type 1	Type 2	Type 3
1	Length of sequence /context	No sequence Poor context Dispersed distribution	Limited sequence	Long sequence Favourable context High density of arte / ecofacts
2	Presence of exceptional items (incl. regional rarity)	Absent	Present	Major element
3	Organic preservation	Absent	Present	Major element
4	Potential for future archaeological investigation	Low	Medium	High
5	Potential for public display	Low	Medium	High
6	Aesthetic appeal	Low	Medium	High
7	Potential for implementation of a long-term management plan	Low	Medium	High

4.2 Assessing site value by attribute

Table 5 is adapted from Whitelaw (1997), who developed an approach for selecting sites meriting heritage recognition status in KwaZulu-Natal. It is a means of judging a site's archaeological value by ranking the relative strengths of a range of attributes (given in the second column of the table). While aspects of this matrix remain qualitative, attribute assessment is a good indicator of the general archaeological significance of a site, with Type 3 attributes being those of highest significance.

4.3 Impact Statement

4.3.1 Assessment of Impacts

A heritage resource impact may be broadly defined as the net change between the integrity of a heritage site with and without the proposed development. This change may be either beneficial or adverse.

Beneficial impacts occur wherever a proposed development actively protects, preserves or enhances a heritage resource. For example, development may have a beneficial effect by preventing or lessening natural site erosion. Similarly, an action may serve to preserve a site for future investigation by covering it with a protective layer of fill. In other cases, the public or economic significance of an archaeological site may be enhanced by actions, which facilitate non-destructive public use. Although beneficial impacts are unlikely to occur frequently, they should be included in the assessment.

More commonly, the effects of a project on heritage sites are of an adverse nature. Adverse impacts occur under conditions that include:

a) destruction or alteration of all or part of a heritage site;
b) isolation of a site from its natural setting; and
c) introduction of physical, chemical or visual elements that are out-of-character with the heritage resource and its setting.

Adverse effects can be more specifically defined as direct or indirect impacts. Direct impacts are the immediately demonstrable effects of a project which can be attributed to particular land modifying actions. They are directly caused by a project or its ancillary facilities and occur at the same time and place. The immediate consequences of a project action, such as slope failure following reservoir inundation, are also considered direct impacts.

Indirect impacts result from activities other than actual project actions. Nevertheless, they are clearly induced by a project and would not occur without it. For example, project development may induce changes in land use or population density, such as increased urban and recreational development, which may indirectly impact upon heritage sites. Increased vandalism of heritage sites, resulting from improved or

newly introduced access, is also considered an indirect impact. Indirect impacts are much more difficult to assess and quantify than impacts of a direct nature.

Once all project related impacts are identified, it is necessary to determine their individual level-of-effect on heritage resources. This assessment is aimed at determining the extent or degree to which future opportunities for scientific research, preservation, or public appreciation are foreclosed or otherwise adversely affected by a proposed action. Therefore, the assessment provides a reasonable indication of the relative significance or importance of a particular impact. Normally, the assessment should follow site evaluation since it is important to know what heritage values may be adversely affected.

The assessment should include careful consideration of the following level-of-effect indicators, which are defined below:

- magnitude
- severity
- duration
- range
- frequency
- diversity
- cumulative effect
- rate of change

4.4 Indicators of Impact Severity

Magnitude
The amount of physical alteration or destruction, which can be expected. The resultant loss of heritage value is measured either in amount or degree of disturbance.

Severity
The irreversibility of an impact. Adverse impacts, which result in a totally irreversible and irretrievable loss of heritage value, are of the highest severity.

Duration
The length of time an adverse impact persists. Impacts may have short-term or temporary effects, or conversely, more persistent, long-term effects on heritage sites.

Range
The spatial distribution, whether widespread or site-specific, of an adverse impact.

Frequency
The number of times an impact can be expected. For example, an adverse impact of variable magnitude and severity may occur only once. An impact such as that resulting from cultivation may be of recurring or on-going nature.

Diversity
The number of different kinds of project-related actions expected to affect a heritage site.

Cumulative Effect
A progressive alteration or destruction of a site owing to the repetitive nature of one or more impacts.

Rate of Change
The rate at which an impact will effectively alter the integrity or physical condition of a heritage site. Although an important level-of-effect indicator, it is often difficult to estimate. Rate of change is normally assessed during or following project construction.

The level-of-effect assessment should be conducted and reported in a quantitative and objective fashion. The methodological approach, particularly the system of ranking level-of-effect indicators, must be

rigorously documented and recommendations should be made with respect to managing uncertainties in the assessment. *(Zubrow, Ezra B.A., 1984).*

4.4.1 Pre-Contact Sites

No Pre-contact sites were identified.

4.4.2 Post-Contact Sites

No Post-contact sites were identified.

4.4.3 Built Environment

Some modern farming related structures (such as troughs and a cistern) was noted on site. These were not of any heritage significance. The area is used for extensive dumping of building materials, which has no significance.

Table 6. Historic Significance

No	Criteria	Significance Rating
1	***Are any of the identified sites or buildings associated with a historical person or group?*** No	N/A
2	***Are any of the buildings or identified sites associated with a historical event?*** No	N/A
3	***Are any of the identified sites or buildings associated with a religious, economic social or political or educational activity?*** No	N/A
4	***Are any of the identified sites or buildings of archaeological significance?*** No	N/A
5	***Are any of the identified buildings or structures older than 60 years?*** No	N/A

Table 7. Architectural Significance

No	**Criteria**	**Rating**
1	***Are any of the buildings or structures an important example of a building type?*** No	N/A
2	***Are any of the buildings outstanding examples of a particular style or period?*** No	N/A
3	***Do any of the buildings contain fine architectural details and reflect exceptional craftsmanship?*** No	N/A
4	***Are any of the buildings an example of an industrial, engineering or technological development?*** No	N/A
5	***What is the state of the architectural and structural integrity of the building?*** No	N/A
6	***Is the building's current and future use in sympathy with its original use (for which the building was designed)?*** N/A	-
7	***Were the alterations done in sympathy with the original design?*** N/A	-
8	***Were the additions and extensions done in sympathy with the original design?***	

	N/A	-
9	***Are any of the buildings or structures the work of a major architect, engineer or builder?*** No.	N/A

Even though each building needs to be evaluated as a single artefact the site still needs to be evaluated in terms of its significance in its geographic area, city, town, village, neighbourhood or precinct. This set of criteria determines the spatial significance.

Table 8. Spatial Significance

No	Criteria	Rating
1	***Can any of the identified buildings or structures be considered a landmark in the town or city?*** No	-
2	***Do any of the buildings contribute to the character of the neighborhood?*** No	-
3	***Do any of the buildings contribute to the character of the square or streetscape?*** No	-
4	***Do any of the buildings form part of an important group of buildings?*** No	-

5. Impact Evaluation

This HIA Methodology assists in evaluating the overall effect of a proposed activity on the heritage environment. The determination of the effect of a heritage impact on a heritage parameter is determined through a systematic analysis of the various components of the impact. This is undertaken using information that is available to the heritage practitioner through the process of heritage impact assessment. The impact evaluation of predicted impacts was undertaken through an assessment of the significance of the impacts.

5.1 Determination of Significance of Impacts

Significance is determined through a synthesis of impact characteristics, which include context and intensity of an impact. Context refers to the geographical scale i.e. site, local, national or global whereas intensity is defined by the severity if the impact e.g. the magnitude of deviation from background conditions, the size of the area affected, the duration of the impact and the overall probability of occurrence.
Significance is an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required. The total number of points scored for each impact indicates the level of significance of the impact.

5.2 Impact Rating System

Impact assessment must take account of the nature, scale and duration of effects on the heritage environment whether such effects are positive (beneficial) or negative (detrimental). Each issue / impact is also assessed according to the project stages:

- planning
- construction
- operation
- decommissioning

Where necessary, the proposal for mitigation or optimisation of an impact will be detailed. A brief discussion of the impact and the rationale behind the assessment of its significance has also been included.

5.2.1 Rating System Used to Classify Impacts

The rating system is applied to the potential impact on the receiving environment and includes an objective evaluation of the mitigation of the impact. Impacts have been consolidated into one rating. In assessing the significance of each issue, the following criteria (including an allocated point system) is used:

Table 9. Impact Ratings

NATURE		
Including a brief description of the impact of the heritage parameter being assessed in the context of the project. This criterion includes a brief written statement of the heritage aspect being impacted upon by a particular action or activity.		
GEOGRAPHICAL EXTENT		
This is defined as the area over which the impact will be expressed. Typically, the severity and significance of an impact have different scales and as such bracketing ranges are often required. This is often useful during the detailed assessment of a project in terms of further defining the determined.		
1	Site	The impact will only affect the site.
2	Local/district	Will affect the local area or district.
3	Province/region	Will affect the entire province or region.
4	International and National	Will affect the entire country.
PROBABILITY		
This describes the chance of occurrence of an impact		

1	Unlikely	The chance of the impact occurring is extremely low (Less than a 25% chance of occurrence).
2	Possible	The impact may occur (Between a 25% to 50% chance of occurrence).
3	Probable	The impact will likely occur (Between a 50% to 75% chance of occurrence).
4	Definite	Impact will certainly occur (Greater than a 75% chance of occurrence).
REVERSIBILITY		
This describes the degree to which an impact on a heritage parameter can be successfully reversed upon completion of the proposed activity.		
1	Completely reversible	The impact is reversible with implementation of minor mitigation measures.
2	Partly reversible	The impact is partly reversible but more intense mitigation measures are required.
3	Barely reversible	The impact is unlikely to be reversed even with intense mitigation measures.
4	Irreversible	The impact is irreversible, and no mitigation measures exist.
IRREPLACEABLE LOSS OF RESOURCES		
This describes the degree to which heritage resources will be irreplaceably lost as a result of a proposed activity.		
1	No loss of resource.	The impact will not result in the loss of any resources.
2	Marginal loss of resource	The impact will result in marginal loss of resources.
3	Significant loss of resources	The impact will result in significant loss of resources.
4	Complete loss of resources	The impact is result in a complete loss of all resources.
DURATION		
This describes the duration of the impacts on the heritage parameter. Duration indicates the lifetime of the impact as a result of the proposed activity.		
1	Short term	The impact and its effects will either disappear with mitigation or will be mitigated through natural process in a span shorter than the construction phase (0 – 1 years), or the impact and its effects will last for the period of a relatively short construction period and a limited recovery time after construction, thereafter it will be entirely negated (0 – 2 years).
2	Medium term	The impact and its effects will continue or last for some time after the construction phase but will be mitigated by direct human action or by natural processes thereafter (2 – 10 years).
3	Long term	The impact and its effects will continue or last for the entire operational life of the development but will be mitigated by direct human action or by natural processes thereafter (10 – 50 years).
4	Permanent	The only class of impact that will be non-transitory. Mitigation either by man or natural process will not occur in such a way or such a time span that the impact can be considered transient (Indefinite).
CUMULATIVE EFFECT		

This describes the cumulative effect of the impacts on the heritage parameter. A cumulative effect/impact is an effect, which in itself may not be significant but may become significant if added to other existing or potential impacts emanating from other similar or diverse activities as a result of the project activity in question.		
1	Negligible Cumulative Impact	The impact would result in negligible to no cumulative effects.
2	Low Cumulative Impact	The impact would result in insignificant cumulative effects.
3	Medium Cumulative impact	The impact would result in minor cumulative effects.
4	High Cumulative Impact	The impact would result in significant cumulative effects.
INTENSITY / MAGNITUDE		
Describes the severity of an impact.		
1	Low	Impact affects the quality, use and integrity of the system/component in a way that is barely perceptible.
2	Medium	Impact alters the quality, use and integrity of the system/component but system/ component still continues to function in a moderately modified way and maintains general integrity (some impact on integrity).
3	High	Impact affects the continued viability of the system/component and the quality, use, integrity and functionality of the system or component is severely impaired and may temporarily cease. High costs of rehabilitation and remediation.
4	Very high	Impact affects the continued viability of the system/component and the quality, use, integrity and functionality of the system or component permanently ceases and is irreversibly impaired (system collapse). Rehabilitation and remediation often impossible. If possible rehabilitation and remediation often unfeasible due to extremely high costs of rehabilitation and remediation.
SIGNIFICANCE		
Significance is determined through a synthesis of impact characteristics. Significance is an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required. This describes the significance of the impact on the heritage parameter. The calculation of the significance of an impact uses the following formula: **(Extent + probability + reversibility + irreplaceability + duration + cumulative effect) x magnitude/intensity.** The summation of the different criteria will produce a non weighted value. By multiplying this value with the magnitude/intensity, the resultant value acquires a weighted characteristic which can be measured and assigned a significance rating.		
Points	**Impact Significance Rating**	**Description**
6 to 28	Negative Low impact	The anticipated impact will have negligible negative effects and will require little to no mitigation.
6 to 28	Positive Low impact	The anticipated impact will have minor positive effects.
29 to 50	Negative Medium impact	The anticipated impact will have moderate negative effects and will require moderate mitigation measures.
29 to 50	Positive Medium impact	The anticipated impact will have moderate positive effects.
51 to 73	Negative High impact	The anticipated impact will have significant effects and will require significant mitigation measures to achieve an acceptable level of impact.
51 to 73	Positive High impact	The anticipated impact will have significant positive effects.

74 to 96	Negative Very high impact	The anticipated impact will have highly significant effects and are unlikely to be able to be mitigated adequately. These impacts could be considered "fatal flaws".
74 to 96	Positive Very high impact	The anticipated impact will have highly significant positive effects.

5.3 Assessing Visual Impact

Visual impacts of developments result when sites that are culturally celebrated are visually affected by a development. The exact parameters for the determination of visual impacts have not yet been rigidly defined and are still mostly open to interpretation. CNdV Architects and The Department of Environmental Affairs and Development Planning (2006) have developed some guidelines for the management of the visual impacts of wind turbines in the Western Cape, although these have not yet been formalised. In these guidelines they recommend a buffer zone of 1km around significant heritage sites to minimise the visual impact.

Due to the fact that the project will mainly involve sub-surface infrastructure it is not anticipated that any visual impacts will be encountered.

5.4 Assumptions and Restrictions

- It is assumed that the South African Heritage Resources Information System (SAHRIS) database locations are correct.
- It is assumed that the paleontological information collected for the project is comprehensive.
- It is assumed that the social impact assessment and public participation process of the environmental assessment will result in the identification of any intangible sites of heritage potential.

6. Assessment of Impacts

6.1 Impact Statement

6.1.1 Built Environment

Some structures associated with rural living were identified;

- Brick outbuildings (modern and historic)
- Barb-wire fences (modern)
- Dirt roads (modern)
- Footpaths
- Farming related structures

Mitigation

None of these structures warrant mitigation.

6.1.2 Cultural Landscape

The following landscape types were identified during the study.

Table 10. Cultural Landscapes

Landscape Type	Description	Occurrence still possible?	Likely occurrence?
1 Paleontological	Mostly fossil remains. Remains include microbial fossils such as found in Baberton Greenstones	Yes, sub-surface	Likely
2 Archaeological	Evidence of human occupation associated with the following phases – Early-, Middle-, Late Stone Age, Early-, Late Iron Age, Pre-Contact Sites, Post-Contact Sites	Yes	Unlikely
3 Historic Built Environment	- Historical townscapes/streetscapes - Historical structures; i.e. older than 60 years - Formal public spaces - Formally declared urban conservation areas - Places associated with social identity/displacement	No	No
4 Historic Farmland	These possess distinctive patterns of settlement and historical features such as: - Historical farm yards - Historical farm workers villages/settlements - Irrigation furrows - Tree alignments and groupings - Historical routes and pathways - Distinctive types of planting - Distinctive architecture of cultivation e.g. planting blocks, trellising, terracing, ornamental planting.	No	No
5 Historic rural town	- Historic mission settlements - Historic townscapes	No	No
6 Pristine natural landscape	- Historical patterns of access to a natural amenity - Formally proclaimed nature reserves - Evidence of pre-colonial occupation	No	No

	- Scenic resources, e.g. view corridors, viewing sites, visual edges, visual linkages - Historical structures/settlements older than 60 years - Pre-colonial or historical burial sites - Geological sites of cultural significance.		
7 Relic Landscape	- Past farming settlements - Past industrial sites - Places of isolation related to attitudes to medical treatment - Battle sites - Sites of displacement,	No	No
8 Burial grounds and grave sites	- Pre-colonial burials (marked or unmarked, known or unknown) - Historical graves (marked or unmarked, known or unknown) - Graves of victims of conflict - Human remains (older than 100 years) - Associated burial goods (older than 100 years) - Burial architecture (older than 60 years)	Yes,	Unlikely
9 Associated Landscapes	- Sites associated with living heritage e.g. initiation sites, harvesting of natural resources for traditional medicinal purposes - Sites associated with displacement & contestation - Sites of political conflict/struggle - Sites associated with an historic event/person - Sites associated with public memory	No	No
10 Historical Farmyard	- Setting of the yard and its context - Composition of structures - Historical/architectural value of individual structures - Tree alignments - Views to and from - Axial relationships - System of enclosure, e.g. defining walls - Systems of water reticulation and irrigation, e.g. furrows - Sites associated with slavery and farm labour - Colonial period archaeology	No	No
11 Historic institutions	- Historical prisons - Hospital sites - Historical school/reformatory sites - Military bases	No	No
12 Scenic visual	- Scenic routes	No	No
13 Amenity landscape	- View sheds - View points - Views to and from - Gateway conditions - Distinctive representative landscape conditions - Scenic corridors	No	No

7. Measuring Impacts

In 2003 the SAHRA (South African Heritage Resources Agency) compiled the following guidelines to evaluate the cultural significance of individual heritage resources:

- **Type of Resource**
  - Place
  - Archaeological Site
  - Structure
  - Grave
  - Palaeontological Feature
  - Geological Feature

- **Type of Significance**

  - Historic Value
    - Important in the community, or pattern of history
    - Important in the evolution of cultural landscapes and settlement patterns
    - Important in exhibiting density, richness or diversity of cultural features illustrating the human occupation and evolution of the nation, province, region or locality.
    - Important for association with events, developments or cultural phases that have had a significant role in the human occupation and evolution of the nation, province, region or community.
    - Important as an example for technical, creative, design or artistic excellence, innovation or achievement in a particular period.
    - It has strong or special association with the life or work of a person, group or organisation of importance in history
    - Importance for close associations with individuals, groups or organisations whose life, works or activities have been significant within the history of the nation, province, region or community.
    - It has significance relating to the history of slavery
    - Importance for a direct link to the history of slavery in South Africa.

  - Aesthetic Value
    - It is important in exhibiting particular aesthetic characteristics valued by a community or cultural group.
    - Important to a community for aesthetic characteristics held in high esteem or otherwise valued by the community.
    - Importance for its creative, design or artistic excellence, innovation or achievement.
    - Importance for its contribution to the aesthetic values of the setting demonstrated by a landmark quality or having impact on important vistas or otherwise contributing to the identified aesthetic qualities of the cultural environs or the natural landscape within which it is located.
    - In the case of an historic precinct, importance for the aesthetic character created by the individual components which collectively form a significant streetscape, townscape or cultural environment.

  - Scientific Value
    - It has potential to yield information that will contribute to an understanding of natural or cultural heritage
    - Importance for information contributing to a wider understanding of natural or cultural history by virtue of its use as a research site, teaching site, type locality, reference or benchmark site.
    - Importance for information contributing to a wider understanding of the origin of the universe or of the development of the earth.

- Importance for information contributing to a wider understanding of the origin of life; the development of plant or animal species, or the biological or cultural development of hominid or human species.
- Importance for its potential to yield information contributing to a wider understanding of the history of human occupation of the nation, Province, region or locality.
- It is important in demonstrating a high degree of creative or technical achievement at a particular period
- Importance for its technical innovation or achievement.

a) Does the site contain evidence, which may substantively enhance understanding of culture history, culture process, and other aspects of local and regional prehistory?

- internal stratification and depth
- chronologically sensitive cultural items
- materials for absolute dating
- association with ancient landforms
- quantity and variety of tool type
- distinct intra-site activity areas
- tool types indicative of specific socio-economic or religious activity
- cultural features such as burials, dwellings, hearths, etc.
- diagnostic faunal and floral remains
- exotic cultural items and materials
- uniqueness or representativeness of the site
- integrity of the site

b) Does the site contain evidence which may be used for experimentation aimed at improving archaeological methods and techniques?

- monitoring impacts from artificial or natural agents
- site preservation or conservation experiments
- data recovery experiments
- sampling experiments
- intra-site spatial analysis

c) Does the site contain evidence which can make important contributions to paleo environmental studies?

- topographical, geomorphological context
- depositional character
- diagnostic faunal, floral data

d) Does the site contain evidence which can contribute to other scientific disciplines such as hydrology, geomorphology, pedology, meteorology, zoology, botany, forensic medicine, and environmental hazards research, or to industry including forestry and commercial fisheries?

o Social Value / Public Significance

- It has strong or special association with a particular community or cultural group for social, cultural or spiritual reasons
- Importance as a place highly valued by a community or cultural group for reasons of social, cultural, religious, spiritual, symbolic, aesthetic or educational associations.
- Importance in contributing to a community's sense of place.

a) Does the site have potential for public use in an interpretive, educational or recreational capacity?

- integrity of the site

- technical and economic feasibility of restoration and development for public use
- visibility of cultural features and their ability to be easily interpreted
- accessibility to the public
- opportunities for protection against vandalism
- representativeness and uniqueness of the site
- aesthetics of the local setting
- proximity to established recreation areas
- present and potential land use
- land ownership and administration
- legal and jurisdictional status
- local community attitude toward development

b) Does the site receive visitation or use by tourists, local residents or school groups?

- Ethnic Significance
  Does the site presently have traditional, social or religious importance to a particular group or community?
  - ethnographic or ethno-historic reference
  - documented local community recognition or, and concern for, the site

- Economic Significance
  What value of user-benefits may be placed on the site?
  - visitors' willingness-to-pay
  - visitors' travel costs

- Scientific Significance
  a) Does the site contain evidence, which may substantively enhance understanding of historic patterns of settlement and land use in a particular locality, regional or larger area?
  b) Does the site contain evidence, which can make important contributions to other scientific disciplines or industry?

- Historic Significance
  a) Is the site associated with the early exploration, settlement, land use, or other aspect of southern Africa's cultural development?
  b) Is the site associated with the life or activities of a particular historic figure, group, organization, or institution that has made a significant contribution to, or impact on, the community, province or nation?
  c) Is the site associated with a particular historic event whether cultural, economic, military, religious, social or political that has made a significant contribution to, or impact on, the community, province or nation?
  d) Is the site associated with a traditional recurring event in the history of the community, province, or nation, such as an annual celebration?

- Public Significance
  a) Does the site have potential for public use in an interpretive, educational or recreational capacity?
  - visibility and accessibility to the public
  - ability of the site to be easily interpreted
  - opportunities for protection against vandalism
  - economic and engineering feasibility of reconstruction, restoration and maintenance
  - representativeness and uniqueness of the site
  - proximity to established recreation areas
  - compatibility with surrounding zoning regulations or land use

- land ownership and administration
- local community attitude toward site preservation, development or destruction
- present use of site

b) Does the site receive visitation or use by tourists, local residents or school groups?

o Other

- Is the site a commonly acknowledged landmark?
- Does, or could, the site contribute to a sense of continuity or identity either alone or in conjunction with similar sites in the vicinity?
- Is the site a good typical example of an early structure or device commonly used for a specific purpose throughout an area or period of time?
- Is the site representative of a particular architectural style or pattern?

For each predicted impact, criteria are described. These criteria include the **magnitude** (size or degree scale), which also includes the **type** of impact, being either a positive or negative impact; the **duration** (temporal scale); and the **extent** (spatial scale), as well as the **probability** (likelihood). The methodology is quantitative and generated through a spreadsheet but requires professional judgement in the application of the criteria.
When assessing impacts, broader considerations are also considered, these include the **confidence** with which the assessment was undertaken, the **reversibility** of the impact and the resource **irreplaceability**.

Calculations
(as applied in the excel spreadsheet 'Mangaung 2019.xls')

For each predicted impact, certain criteria are applied to establish the likely **significance** of the impact, firstly in the case of no mitigation being applied and then with the most effective mitigation measure(s) in place.

These criteria include the **magnitude** *(*size or degree scale), which also includes the **type** of impact, being either a positive or negative impact; the **duration** (temporal scale); and the **extent** (spatial scale). These numerical ratings are used in an equation whereby the **consequence** of the impact can be calculated. Consequence is calculated as follows:

Consequence = type x (magnitude + duration + extent).

To calculate the significance of an impact, the **probability** (or likelihood) of that impact occurring is applied to the consequence.

Significance = consequence x probability

Depending on the numerical result, the impact would fall into a significance category as negligible, minor, moderate or major, and the type would be either positive or negative.

The following tables show the scales used to classify the above variables and define each of the rating categories.

7.1 Magnitude

The magnitude refers to the degree of alteration of the affected environmental receptor. The relevant descriptor for magnitude is selected by the user (refer to Table).

Table 11. Description of magnitude and assigned numerical values

Numerical Rating	Magnitude	
	Category	**Descriptors**
1	**Negligible**	Natural and/ or social functions and/ or processes are negligibly altered

2	**Very low**	Natural and/ or social functions and/ or processes are slightly altered
3	**Low**	Natural and/ or social functions and/ or processes are somewhat altered
4	**Moderate**	Natural and/ or social functions and/ or processes are moderately altered
5	**High**	Natural and/ or social functions and/ or processes are notably altered
6	**Very high**	Natural and/ or social functions and/ or processes are majorly altered
7	**Extremely high**	Natural and/ or social functions and/ or processes are severely altered

*NOTE: Where applicable, the magnitude of the impact is related to a relevant standard or threshold or is based on specialist knowledge and understanding of that particular field.

7.2 Duration

The duration refers to the length of permanence of the impact on the environmental receptor. The relevant descriptor for duration is selected by the user (refer to Table).

Table 12. Description of duration and assigned numerical values

Numerical Rating	**Duration**	
	Category	**Descriptors**
1	**Immediate**	Impact will self-remedy immediately
2	**Brief**	Impact will not last longer than 1 year
3	**Short term**	Impact will last between 1 and 5 years
4	**Medium term**	Impact will last between 5 and 10 years
5	**Long term**	Impact will last between 10 and 15 years
6	**On-going**	Impact will last between 15 and 20 years
7	**Permanent**	Impact may be permanent, or in excess of 20 years

7.3 Extent

The extent refers to the geographical scale of impact on the environmental receptor. The relevant descriptor for extent is selected by the user (refer to Table).

Table 13. Description of extent and assigned numerical values

Numerical Rating	**Extent**	
	Category	Descriptors
1	**Very limited**	Impacts very limited / felt in isolated areas of the study area
2	**Limited**	Impacts limited to specific parts of the study area
3	**Local**	Impacts felt mostly throughout the study area
4	**Municipal area**	Impacts felt outside the study area, at a municipal level

5	**Regional**	Impacts felt outside the study area, at a regional / provincial level
6	**National**	Impacts felt outside the study area, at a national level
7	**International**	Impacts felt outside the study area, at an international level

7.4 Probability

To calculate the significance of an impact, the probability (or likelihood) of that impact occurring is also taken into account. (Refer to Table).

Table 14. Definition of probability ratings

Numerical Rating	Probability	
	Category	**Descriptors**
1	**Highly unlikely / None**	Expected never to happen
2	**Rare / improbable**	Conceivable, but only in extreme circumstances, and/or might occur for this project although this has rarely been known to result elsewhere
3	**Unlikely**	Has not happened yet but could happen once in the lifetime of the project, therefore there is a possibility that the impact will occur
4	**Probable**	Has occurred here or elsewhere and could therefore occur
5	**Likely**	The impact may occur
6	**Almost certain / Highly probable**	It is most likely that the impact will occur
7	**Certain / Definite**	There are sound scientific reasons to expect that the impact will definitely occur

7.5 Significance

These are auto-calculated in the spreadsheet as described above and includes the following categories in Table 11. This table is for illustration only.

Table 15. Application of significance ratings

Range		Significance rating
-147	-109	Major (-)
-108	-73	Moderate (-)
-72	-36	Minor (-)
-35	-1	Negligible (-)
0	0	Neutral
1	35	Negligible (+)
36	72	Minor (+)
73	108	Moderate (+)

109	147	Major (+)

The following, broader considerations will also be considered. These include the level of confidence in the assessment rating; the reversibility of the impact; and the irreplaceability of the resource as set out in Tables 12, 13 and 14 respectively.

Table 16. Definition of confidence ratings

Rating	Descriptor
Low	Judgement is based on intuition
Medium	Determination is based on common sense and general knowledge
High	Substantive supportive data exists to verify the assessment

Table 17. Definition of reversibility ratings

Rating	Descriptor
Low	The affected environment will not be able to recover from the impact - permanently modified
Medium	The affected environment will only recover from the impact with significant intervention
High	The affected environmental will be able to recover from the impact

Table 18. Definition of irreplaceability ratings

Rating	Descriptor
Low	The resource is not damaged irreparably or is not scarce
Medium	The resource is damaged irreparably but is represented elsewhere
High	The resource is irreparably damaged and is not represented elsewhere

8. Description of Affected Environment

8.1 Map of Key Features

Figure 4. Map of Key Features

8.1.1 Findings

Some modern ruins were found scattered over the property. None of these had any heritage significance and they have been documented photographically during the field survey.

9. Baseline

9.1 Palaeontology

Several paleontological studies have been performed in this general area. The area is indicated as *Very High Importance* on the SAHRIS Paleo Sensitivity Map. A field assessment and protocol for finds is required.

Figure 5. *PalaeoSensitivity* Map

9.2 Stone Age

Extensive research on the Stone Age in this area comes from Goodwin, Van Riet Lowe and Humphreys. Humphreys compiled a map of Fauresmith manufacture sites from 1928, 1929 & 1937 published research of Goodwin and Van Riet Lowe. The map illustrates Fauresmith (circle) and "Stellenbosch" (black dot) manufacturing sites although most of these sites also contain both Smithfield A and B material but in particular Smithfield A with Fauresmith-related sites. It also does not indicate the surface finds of the

Fauresmith tradition that are not manufacturing sites. The most important fact to take from this is that the subject area falls within a known area of the Fauresmith-tradition.

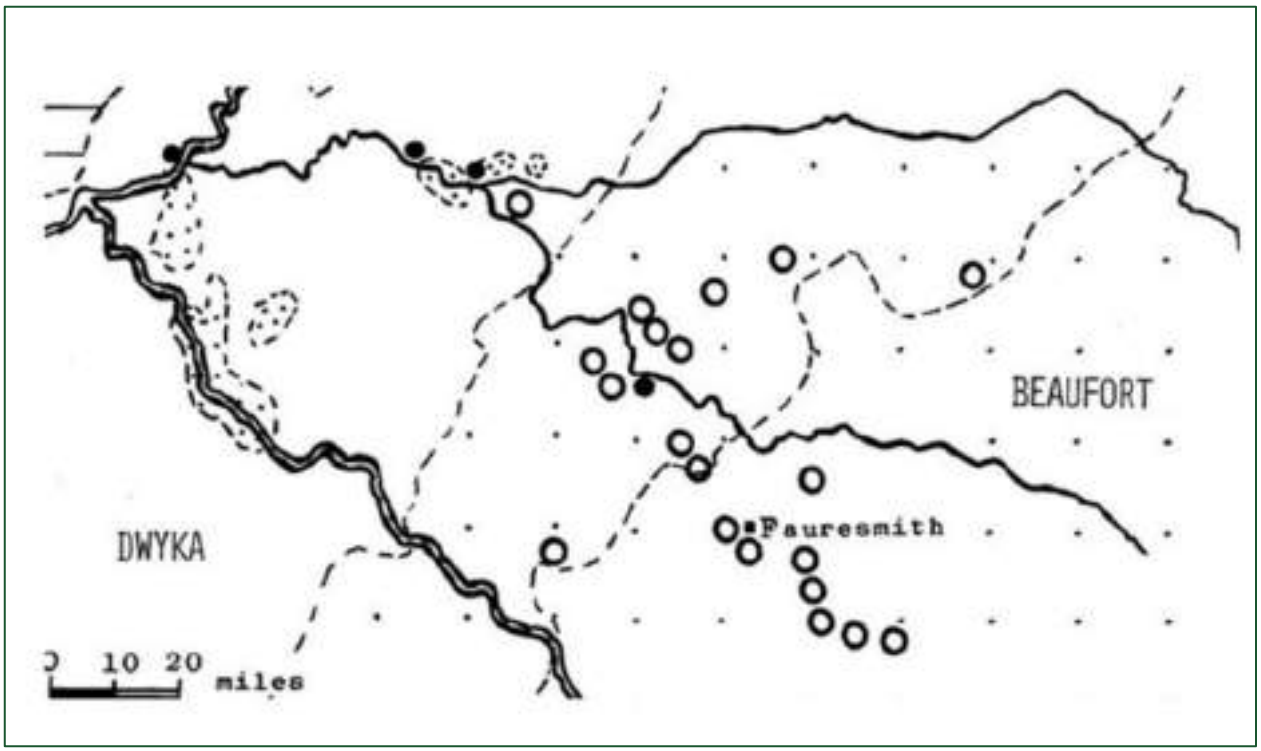

Figure 6. Stellenbosch and Fauresmith sites as per Humphreys (1971)

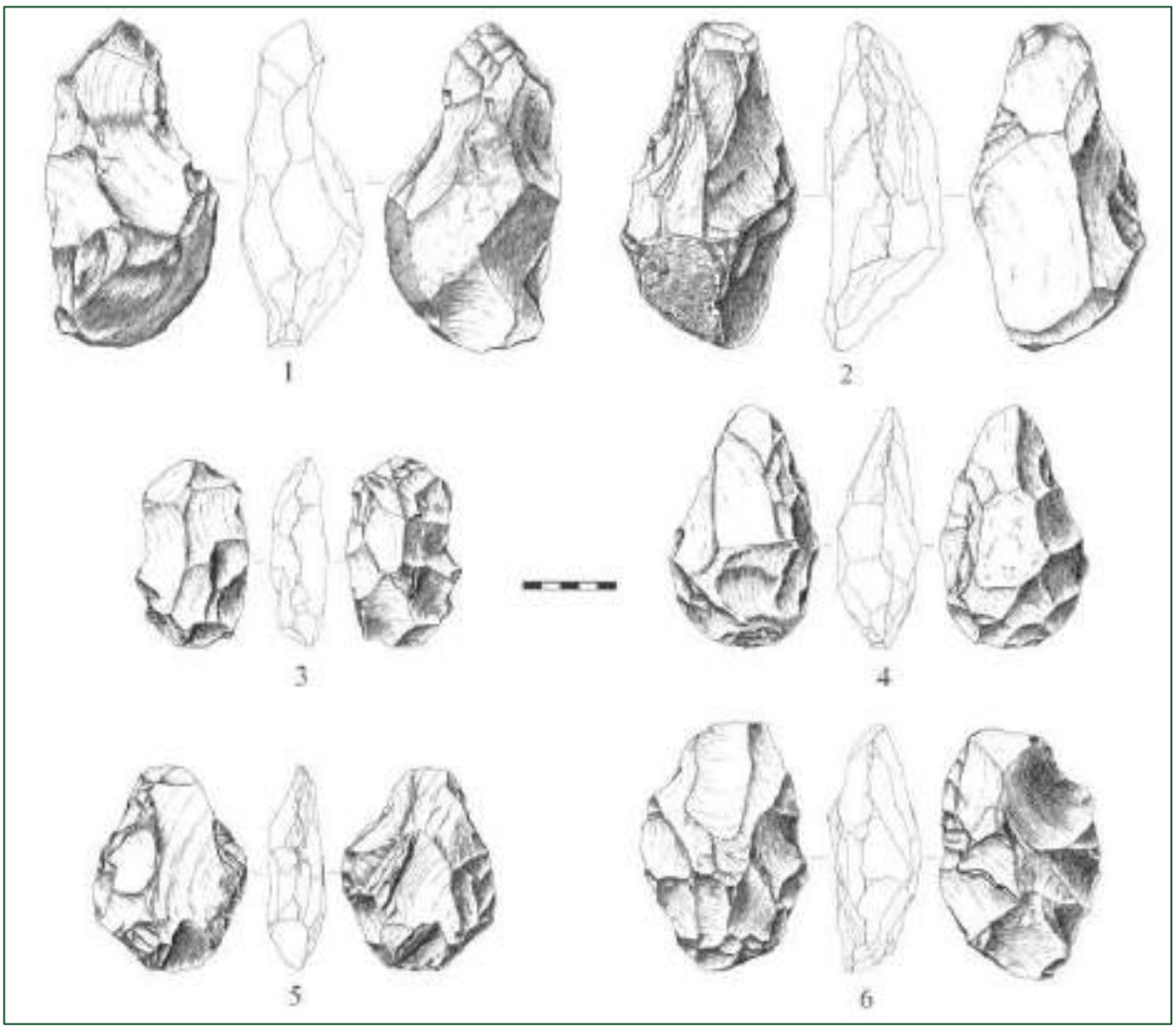

Figure 7. (1,2) Handaxes with large side removal; (3-6) handaxes (Pollarolo, Susino, Kuman, Bruxelles, 2010)

Samson (1974) states that the stratigraphic evidence from three different areas in South Africa demonstrates that the industry following the late Acheulian is not the so-called “Fauresmith”, but a complex without any of the characteristics of the Acheulian samples such as hand-axes, cleavers and picks. He furthermore indicate that secondary working of tools is virtually absent in these areas.

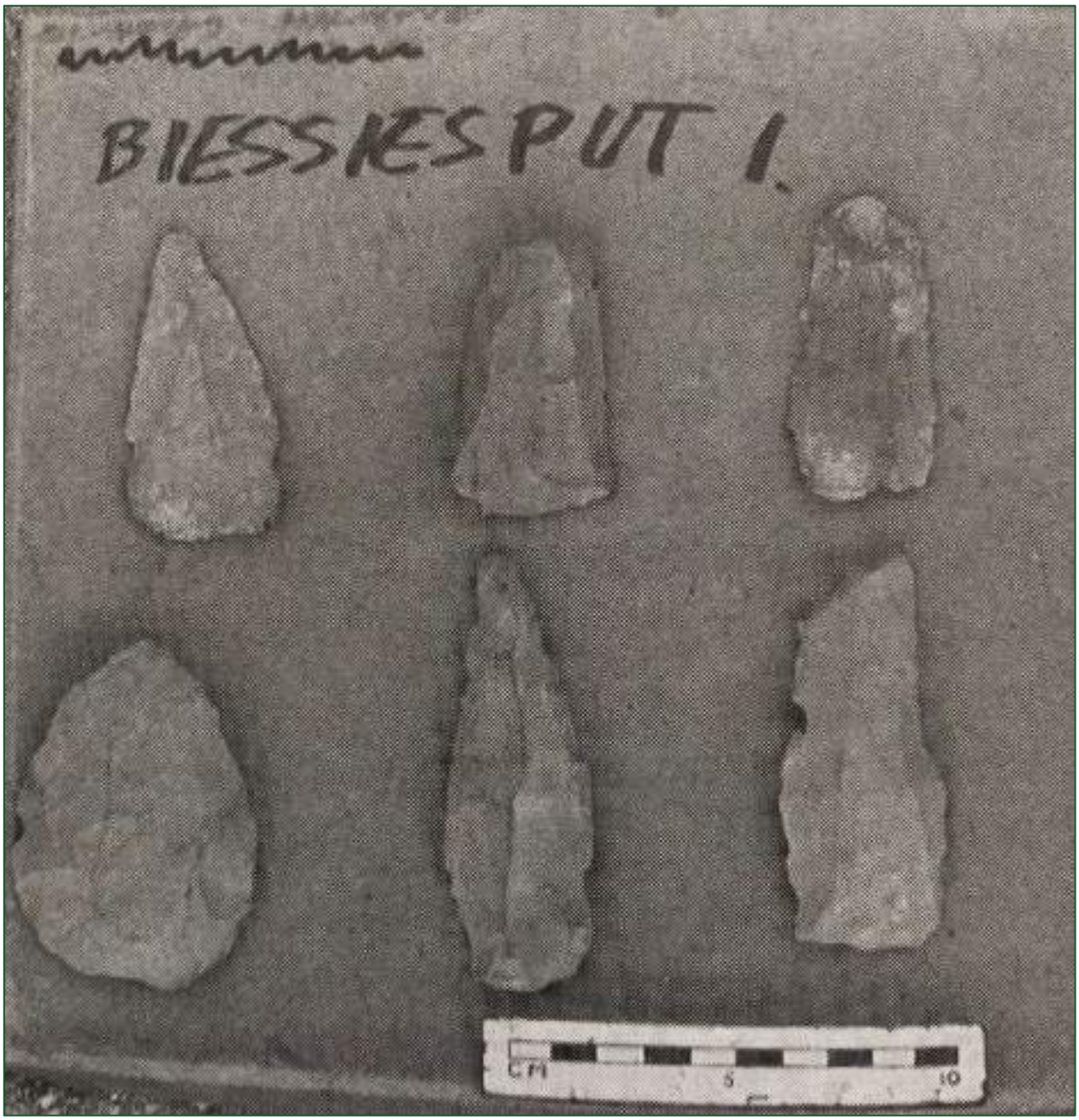

Figure 8. Fauresmith Tools (P. Mitchell, 2002)

Fauresmith Industry manufacturing sites are found on the following farms in the Xhariep District;

- Blaauwheuwel site along the Van Zyl Spruit, a tributary of the Proses Spruit
- Brakfontein (Fauresmith-tradition type site situated 19 km outside Koffiefontein on the road between Koffiefontein and Fauresmith)
- Dwarsvlei-Erfdeel-Fauresmith Townlands
- Koffiefontein
- Leeuwarden
- Petrusberg
- Rorich's Hoop
- Rooidraai
- Spitzkop I and Spitzkop II

- Valschfontein
- Zuurfontein (also along the Van Zyl Spruit)

Material catalogued as Fauresmith-tradition at the National Museum, Bloemfontein, mainly relates to the Orange River area, collected by Sampson during the rescue operation for the new Orange River Scheme (construction of the Gariep Dam).

Goodwin and Van Riet Lowe (1929, pp. 91-92) describe the finding place of the Fauresmith-tradition material at the Fauresmith Town Spruit as *"...in the immediate vicinity of the village, exposed in a bed of water-borne gravel that contains vast quantities of Fauresmith Industry remains." The characteristic artefact of the Fauresmith-tradition are handaxes, described as "a neat almond, sometimes ovate.....generally small [size], and the implements are of a length and weight which make them eminently suitable for use in the hand" and are noted as in general being found in dense concentrations.*

The subject area falls within the boundary of the Smithfield A distribution area as delineated by Goodwin and Van Riet Lowe (1929) in a map of the Orange Free State Smithfield Industry sites.

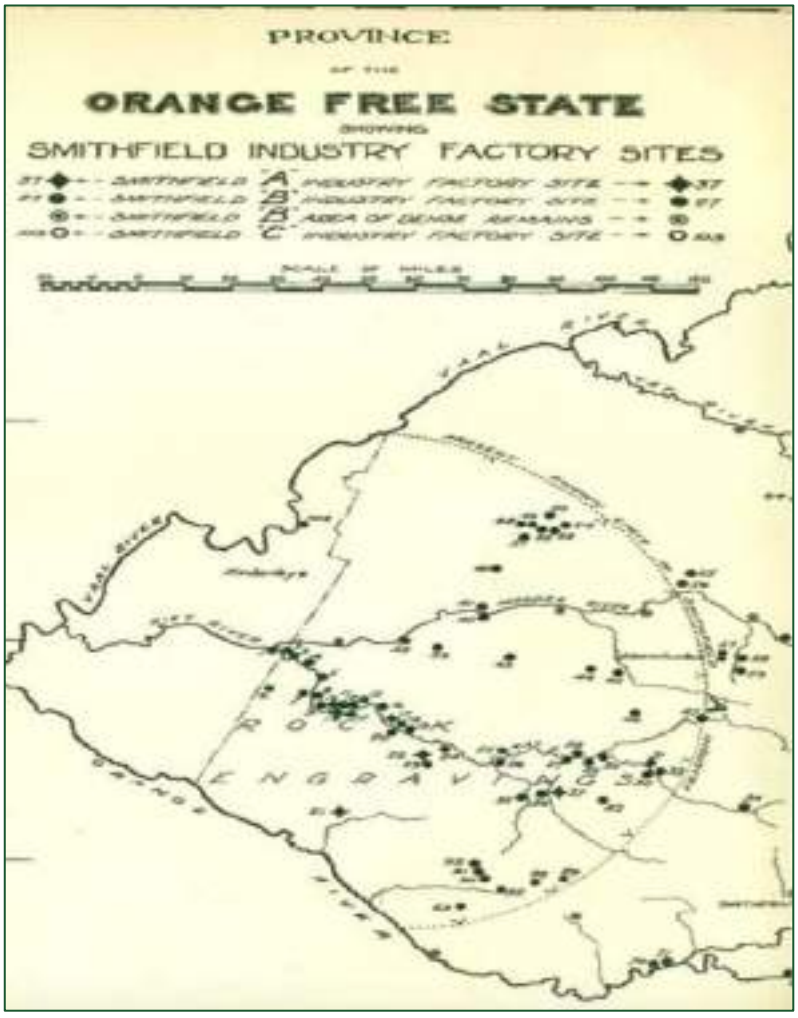

Figure 9. Smithfield A, B & C sites as per van Riet Lowe and Goodwin

A typical factory-site assemblage is described from the Lockshoek site and include:

- Concavo-convex scrapers (restricted to Smithfield A)
- Large circular scrapers (restricted to Smithfield A)
- Duckbill end-scrapers
- Side-scrapers
- Trimmed points
- Stone borers
- Bored Stones
- Grooved Stones
- Grindstones
- Pounders and grinders
- Fabricators: cores; detaching-hammers; trimming-stones; anvils

According to them no notched scrapers are associated with the Smithfield A industry, while re-used Fauresmith hand axes and re-trimmed flakes are found in association with Smithfield industries (Goodwin & Van Riet Lowe, 1929, p. 153).

List of Smithfield sites in vicinity of the study area:

- Smithfield A:
    - Blaauwheuwel 425 (also a Fauresmith industry site)
    - Brakfontein No 231 (typesite for Fauresmith industry – 15 km from Fauresmith on road to Koffiefontein)
    - Lockshoek 191 (also a Fauresmith site) – 27 km north of Jagersfontein

- Smithfield B:
    - Blaauwheuwel
    - Lockshoek

- Smithfield C: None recorded in close proximity of the subject area

9.3 Iron Age

In about 1823, the missionary Rev Burchell hired armed Griqua to protect BaThlaping living at Dithakong, about 300 km northwest of Bloemfontein. These BaThlaping were some of the first Sotho-Tswana people to have been met by Europeans from the Cape (about 1801). The word 'Dithakong' means 'place of walls' and refers to a large concentration of stonewalling on a hill above the 19th century settlement.

Literally, thousands of similar stonewalled settlements lie scattered across the highveld of the Free State. The oldest type of walling stands near the hill known as Ntsuanatsatsi, the legendary place of origin of BaFokeng. Although Tswana-speaking now, new archaeological research indicates that the Fokeng moved up from northern KwaZulu-Natal and were originally Nguni speaking. Type N walling, as it is known, emphasises the centre/side axis expressed through concentric circles: the inner circle encompasses cattle byres and the men's court, while the female residential zone of beehive houses and grain bins constitutes the outer circle. An outer wall sometimes incorporates small stock enclosures because these animals are associated with women. This type of walling first dates to the 15th century.

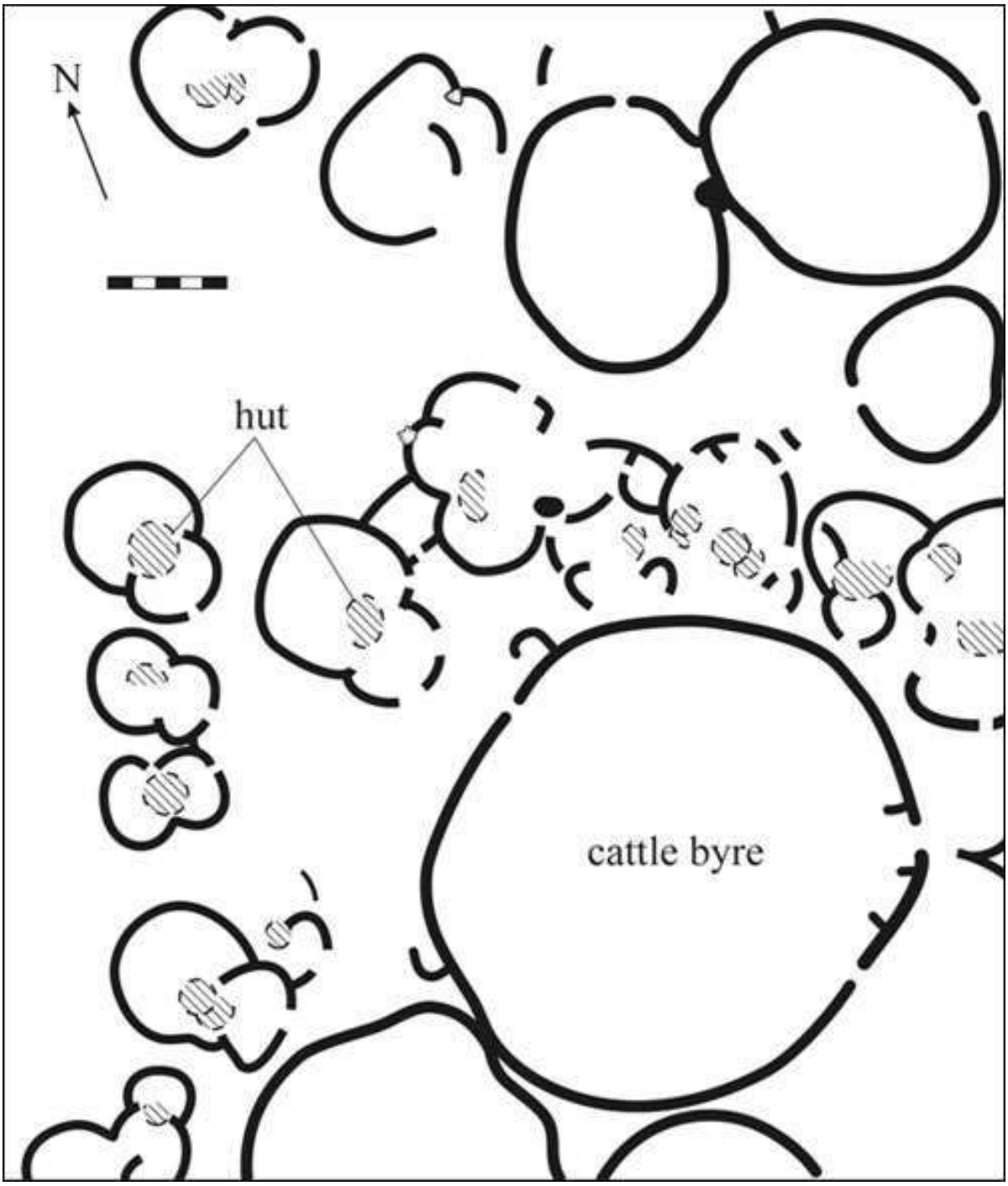

Figure 10. Central Cattle Pattern of the Iron Age

According to oral traditions, Tswana people from the west moved across the Vaal River, found BaFokeng at Ntsuanatsatsi, and assimilated them. Archaeologically, this interaction created another type of walling, called Type V, named after Vegkop near Heilbron. Among other things, this type of settlement includes the famous 'corbelled huts' that captured the imagination of early travellers. Located on the edge of the central cattle area, these low stone huts served mostly as huts for herd boys. In a few places, adults may have lived in larger examples.

The Sand River Nature Reserve contains several stonewalled settlements accessible to the public.

9.4 Historic Era

The area between the Orange and Vaal rivers, originally known as Transoranje, with its abundance of permanent water sources, was the hunting grounds of the San at the beginning of the 19th century. However, other groups began to infiltrate the area in the early 19th century.

The Griquas under Adam Kok came from the west and settled themselves near the area later known as Philippolis. As a result of the Difaqane, many groups came to the Transoranje area in the 1820s from the east, fleeing from Shaka, King of the Zulus, and later Mzilikazi, first King of the Matabele. In 1824, Chief Mzilikazi established himself on ThabaBosiu and began building a strong nation from people previously scattered in the area.

In 1833, the Barolong under the chieftaincy of Moroka II established themselves at what was later known as Thaba Nchu. Around 1821, White stock farmers crossed the Orange River in search of grazing land, after drought and locust infestations ravaged the Cape Colony. Sometime between 1820 and 1826, trek Boer farmer Johan Nicolaas Brits settled in the Transoranje area. The area was convenient as it had a small stream and a fountain provided him with a good water supply.

Johan Nicolaas Brits built a pioneer's home close to the fountain. During the Great Trek many other Voortrekkers also settled in the area. Because these Boers were from the Cape Colony, they were still considered British subjects.

Over a period of time, conflict grew between the different population groups in the Transoranje area, resulting in British intervention. Therefore, in 1846, Major Henry Douglas Warden was appointed to set up a British residency in the area. Warden was tasked with the difficult job of maintaining peace between the different population groups and to set up an administration. His immediate orders were to set up a residency as soon as possible in a centrally situated place, between the areas occupied by Adam Kok and Mosheshwe.

Warden accidentally came across the fountain area between the Riet and Modder rivers. From a military point of view, Warden found the area suitable because it was situated in a small valley surrounded by hills on all sides and was free of horse sickness. The centrality of the site would also make it easy for transport riders to bring necessary commodities to the settlement.

Warden's troops, known as the Cape Riflemen, arrived in Bloemfontein on 26 March 1846 and Warden followed shortly after. He was charmed by the position of the new residency and took over the farm 'Bloemfontein' from Brits and paid him 500 *rijksdaalders* for the layout and improvements that he made. At the time the farm consisted of a small mud house with a garden in the front and an orchard which was watered through a furrow.

One division of Warden's soldiers began building a fort to the north of the fountain which was named Fort Drury, after Sergeant Drury who served the dual function of garrison's doctor and teacher to the children of the soldiers. The second division began building the official residency at the top end of the present St George Street. While this was being done, Warden moved temporarily into the Brits' house. The third division of the regiment concentrated on building clay huts for the soldiers and stables for the horses, which was the beginning of the settlement.

However, relations between the different groups in the area were still strained, with the biggest problem being land. To put an end to this problem, Sir Henry Smith, Governor of the Cape Colony, annexed the area and renamed it the Orange River Sovereignty. This led to the Battle of Boomplaats between the British and Boers who were unhappy with the annexation, which resulted in the British increasing their garrison to 400 men to defend the Bloemfontein area. In addition, a more strategically situated fort called Queen's Fort, was built to replace Fort Drury. Fort Queen was situated at the top end of what was later known as Monument Road. At the foot of the fort were the officers' houses, barracks for the soldiers, the horses' stables and the Commissioner's depot.

Bloemfontein was officially founded in 1846 as a fort by British army major Henry Douglas Warden as a British outpost in the Transoranje region, at that stage occupied by various groups of peoples including Cape Colony Trek Boers, Griqua, and Barolong.

Warden originally chose the site largely because of its proximity to the main route to Winburg, the spacious open country, and the absence of horse sickness. Bloemfontein was the original farm of Johannes Nicolaas Brits born 21 February 1790, owner and first inhabitant of Bloemfontein.

The town was surveyed and pegged out by Andrew Hudson Bain, whose layout took the form of long streets that were parallel to the stream running in a north and south direction. The shorter streets were at right angles to the long ones and the town continued to expand northwards of the stream. Bain's plans went only as far north as St Andrews Street.

The Orange River Colony was made a British sovereignty and in 1848 Sir Harry Smith issued a proclamation establishing a form of government, with Bloemfontein as its seat. On 23 February 1854 the Bloemfontein Convention was signed, which gave the Orange River Sovereignty self-governing status, the first President being Mr. Josias Philip Hoffman. On 11 March 1854, Clark, together with staff and troops, left the Orange River Sovereignty and the area became an independent Republic. The name was changed to the Orange Free State (OFS) and Bloemfontein became the official capital.

In August 1855, JN Boshoff succeeded Hoffman as Hoffman as President of the OFS. During President Boshoff's period in office, Bloemfontein grew slowly but steadily. By 1858, the need for a municipality or town council became stronger and in April 1859 five municipal commissioners were chosen, with James Cameroon becoming the first Town Clerk, tax collector and market-master. With the establishment of a municipality, plans were now made for a regular market and in April 1859 the market began, which quickly became a profitable venture and served as an important source of income.

MW Pretorius succeeded Boshoff in 1860, chosen mainly because Free State residents hoped it would strengthen their bond with the South African Republic. JH Brand succeeded Pretorius in 1864 and was re-elected to office for five consecutive periods until his death in 1888.

The discovery of diamonds between 1867 and 1871, and the discovery of gold on the Witwatersrand in 1886 led to a general boom in trade and gave stimulus to Bloemfontein's growth. The discovery of diamonds near Hopetown in 1867, in Jagersfontein and next to the banks of the Vaal River around the Du Toit's Pan area in 1869, led to an immense number of fortune seekers rushing to the area between the Vaal and Orange Rivers. In 1871, diamonds were also discovered in Kimberly.

After the discovery of diamonds in the OFS the Griqua Chief Nicolas Waterboer claimed that the area between the Vaal and Orange Rivers rightfully belonged to the Griquas. After some deliberation between Sir Henry Barkly and President Brand, Sir Henry Barkly issued a proclamation that the area known as Griqualand West was now declared a British territory. In March 1876, President Brand undertook a deputation to Britain to discuss compensation for Bloemfontein's loss of the diamond fields. It was decided that Britain would pay a sum of 90 000 pounds as damages to the OFS. During President Brand's long period of office, Bloemfontein became the leading town in the Republic, mainly because the diamond fields created new markets and brought in new trade.

In 1875, the Basotho monument, on the hill near the Fort, was unveiled in memory of the Burghers that lost their lives during the Basotho war of 1865-1866.

During the 1880s, trade in Bloemfontein declined due to the long drought and depression that devastated the OFS. However, trade improved drastically when gold was discovered on the Witwatersrand in 1886. In 1880, Bloemfontein received municipal status with a population of about 2567, and Robert Innes was chosen as the first Town Mayor.

Francis Willem Reitz, who was appointed in 1874 as the OFS Chief Justice, was appointed as candidate in the next election. Reitz accepted the nomination and in December 1888 he was elected as the fifth President of the Orange Free State.

From 1902–10 it served as the capital of the Orange River Colony and since that time as the provincial capital of the Free State. In 1910 it became the Judicial capital of the Union of South Africa.

On 31 May 1910, exactly eight years after the Boers signed the Peace Treaty of Vereeniging that ended the Anglo-Boer War between the British Empire and two Boer states, the South African Republic (Republic of Transvaal) and the Orange Free State, South Africa became a Union.
Due to disagreements over where the Union's capital should be, a compromise was reached that allowed Bloemfontein to host Appellate Division and become the Union's judicial capital. Bloemfontein was also given financial compensation.

On 8 January 1912, the South African Native National Congress (SANNC) was founded in Bloemfontein. The Union of South Africa had not granted rights to black South Africans, causing the organisation's creation. Its primary aim was to fight for the rights of black South Africans.

From 1 to 9 January 1914, James Barry Munnik Hertzog and his supporters met in Bloemfontein to form the National Party of the Orange Free State, and to lay down its principles, following Hertzog's exit from the South African Party in 1913. The National Party grew to govern South Africa in 1948 and implement the policy of racial segregation known as apartheid. When the South African apartheid government passed the Group Areas Act of 1950, the Bloemfontein municipality put into effect changes in the racial set-up of the city.

In 1952 the Bloemfontein municipality began building new residential areas for the city's black population. New residential areas to separate ethnic groups such as Sotho, Xhosa and Tswana were formed. The residential areas were jointly known as Mangaung. Phahameng, a Sotho township, was the first formal housing projects to be approved by the municipality in 1956. In 1968, Mangaung faced serious housing shortages when as much as 3000 to 6000 housing units were needed. To counter this problem, a 55 km east ward expansion called Botshabelo was added in 1979. The Bloemfontein municipality channelled of all black urbanisation to Thaba Nchu and Botshabelo.

In 1994, after the disestablishment of the apartheid government, Bloemfontein, Botshabelo, and Thaba Nchu became part of Motheo District Municipality. The Motheo District Municipality was disestablished on 18 May 2011 and Mangaung was upgraded to become an autonomous metropolitan municipality with Bloemfontein as the main seat.

Free State Provincial Government building Bloemfontein forms part of the Mangaung Metropolitan Municipality, which was upgraded from a Local Municipality in 2011.

Sources:
www.nasmus.co.za
www.theheritageportal.co.za
www.sahistory.org.za/article/colonial-history-bloemfontein

9.5 Archival Research

The main sources of information regarding the heritage sensitivity of this area could be identified. These were;

- Previous heritage studies in the area as per the SAHRIS database
- Historic maps and figures as available in the National Archive

9.6 SAHRIS Database Studies

An extensive research into the SAHRIS database resulted in the identification of the following heritage related studies that have been performed over the last decade in the study area. Only studies within a radius of 50km from the study area were considered.

- Rossouw, L. 2017. Phase 1 Archaeological Impact Assessment of a new township development on Farm Rodenbeck 2972, Bloemfontein, FS Province.
- Rossouw, L. 2018. Heritage Impact Assessment for a portion of the Remaining Extent of the farm Content 1167, Magisterial District of Bloemfontein, Free State Province.
- Rssouw, L. 2017. Phase 1 Heritage Impact Assessment: Plot 4, Spitskop Smallholdings, Bloemfontein, Free State Province.
- Rossouw, L. 2013. Phase 1 Palaeontological & Archaeological Impact Assessment of portion of remainder of the farm Bloemfontein 654, Bloemfontein, Free State Province.
- Rossouw, L. 2016. Heritage Impact Assessment of Portion 1, Plot 13 Lilyvale, Bloemfontein, Free State Province.
- Dreyer, C. 2014. First Phase Archaeological & Heritage Assessment of the Proposed Bypass Water Pipeline Development at Bloemfontein.
- Du Plooy, J. 2018. Heritage Impact Assessment Suzuki Bloemfontein ERVEN 977/2; 977/3; 978/3; 980 & 3937 Bloemfontein.
- Rossouw, L. 2016. Phase 1 Archaeological Impact Assessment of the proposed new Lourierpark township development on Portion 1 of the farm Brandkop 702, Bloemfontein, FS Province.
- Rossouw, L. 2013. Phase 1 Heritage Impact Assessment of a new borrow pit on the farm Sydenham 445/RE, near Bloemfontein, FS Province.
- Bothma, J. 2013. Heritage Impact Assessment for the Proposed Upgrade of National Road N8, Bloemfontein to Thaba Nchu, Free State Province.
- Rossouw, L. 2013. Phase 1 Palaeontological & Archaeological Impact Assessment of a portion of the farm The Retreat 804, Bloemfontein, FS.
- Samie, Q. 2014. Heritage Impact Assessment for Subdivision 3 of the Farm Sunnyside No. 2620 Bram Fischer Airport, Bloemfontein.
- Rossouw, L. 2019. Phase 1 Archaeological Impact Assessment of Portions of Lilyvale 2313 and Bayswater 2865, Bloemfontein.
- Philip, L. 2017. Phase 1 Heritage Impact Assessment Erf 22011 Hospital and Heritage Lifestyle Centre Bloemfontein.
- Botes, J. 2015. Phase 1 Heritage Impact Assessment of the Remainder of the farm Cecilia 2352, Remainder of the farm Bloemfontein 654 and a portion of the farm Kwaggafontein 9300, Bloemfontein, FS Province.
- Rossouw, L. 2017. Heritage Impact Assessment for Gravel Mining on Portion 4 of the farm Kaalspruit, Bloemfontein.
- Rossouw, L. 2017. Phase 1 Heritage Assessment for the proposed mining of sand on the Remaining Extent of the farm Glen Throne 2163, Magisterial District Bloemfontein.
- Rossouw, L. 2017. Heritage Impact Assessment for the proposed construction of a service toad on a portion of Erf 30476 (Public Open Space), Bloemfontein, Free State Province.
- Groenewald, H. 2018. The proposed upgrade of an existing diesel depot on Portion 1 of the farm Rooidam 2354, Bloemfontein, Free State Province.
- Dreyer, C. 2013. First Phase Archaeological & Heritage Assessment of the proposed Solar Farm Developments at Portion 1 & portion 10 of the farm Spes Bona 2355, Bloemfontein.
- Dreyer, L. 2018. The proposed township development on the farm Kloof 2921, Bloemfontein, Free State Province.
- Tomose, N.G. 2012. Phase 1 HIA study for the proposed PV solar energy facilities in Sannaspos, near Bloemfontein, Free State Province.

9.7 Historical Typographical Maps

Especially during the evaluation of historic structures, the use of archived historic maps is very handy. They give a direct chronological reference for such sites and also lead the investigation on the ground.

The following historic map sets are relevant for this study (in chronological order);

- 2926 AB 1951
- 2926 AB 2007

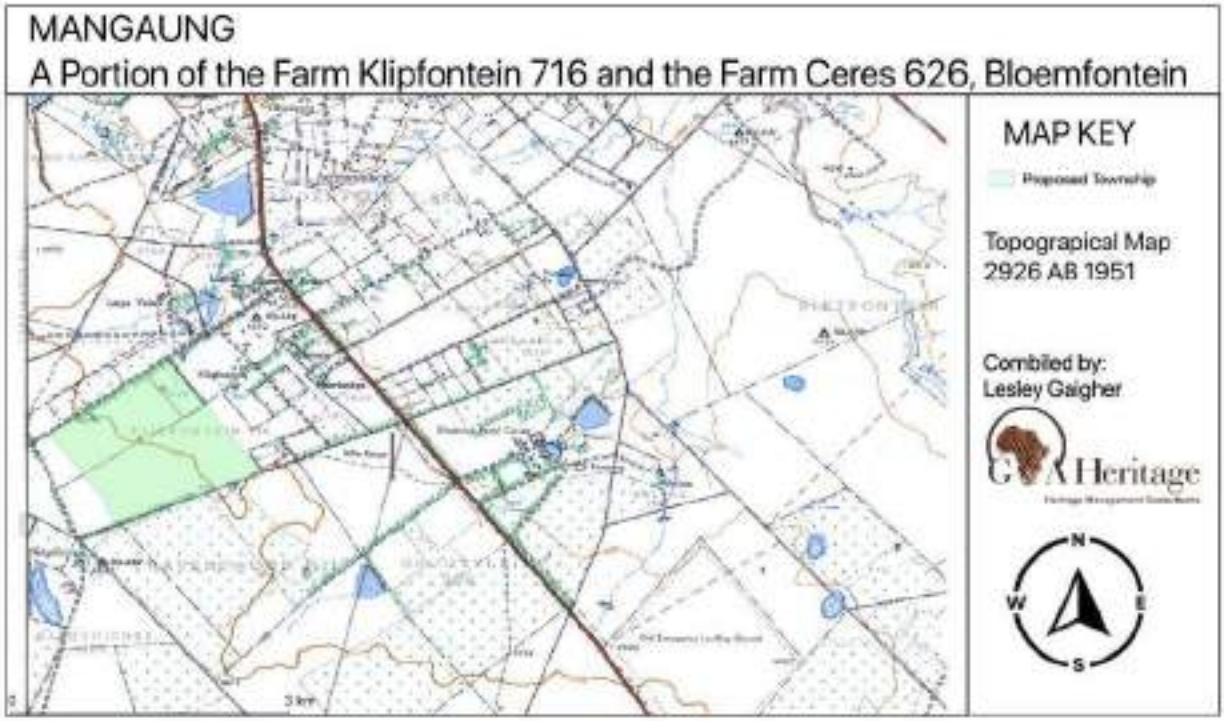

Figure 11. Typographical Map 2926 AB 1951

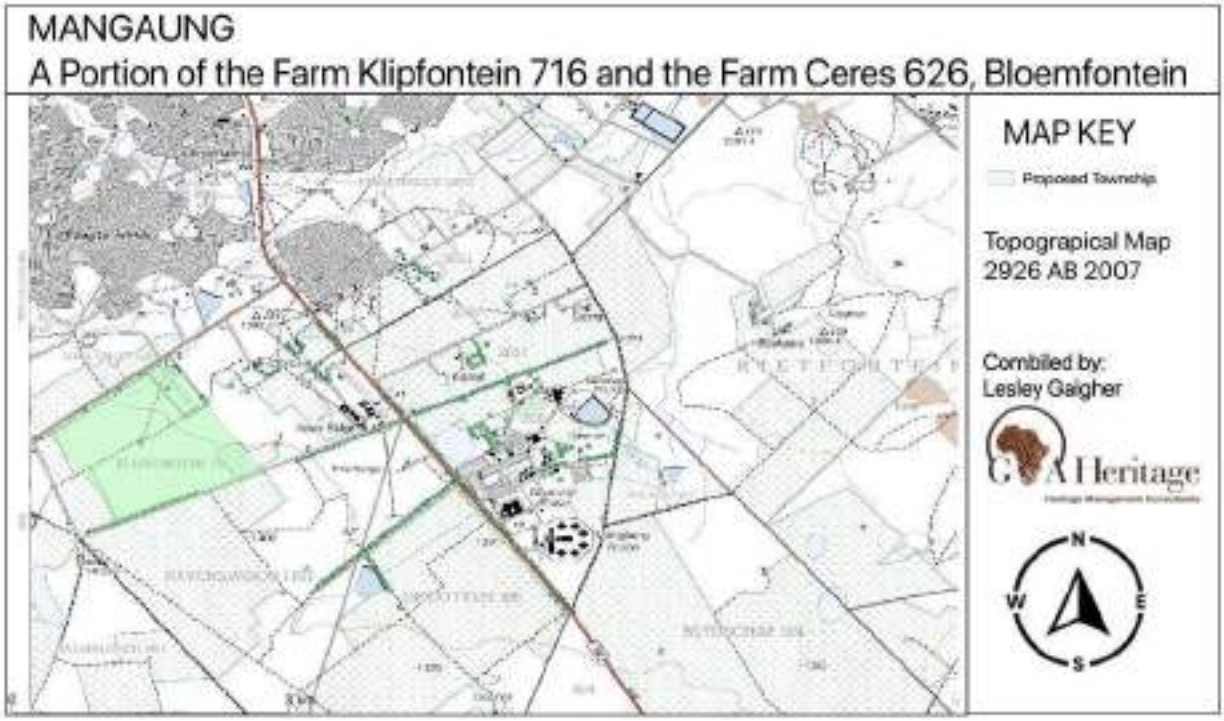

Figure 12. Typographical Map 2926 AB 2007

9.8 Natural / Cultural Landscape

The study area is characterised by open fields and grazing areas with patches of eucalyptus trees and some dumping of building materials.

10. Photos

Figure 13. Northern section of the study area near the tar road

Figure 14. Informal soccer field on the northern side of the study area

Figure 15. Illegal dumping and dangerous grazing occurring in the study area

Figure 16. Northern section of the study area, view towards the south

Figure 17. Northern section of the study area, view towards the east

Figure 18. Dam located in the study area near the northern boundary

Figure 19. Water cistern and troughs

Figure 20. Troughs close up

Figure 21. Water cistern close up

Figure 22. A feature near the water cistern

Figure 23. Modern ruins near the water cistern

Figure 24. The study area is currently being used for grazing

Figure 25. Centre of the study area, view towards the south

Figure 26. Centre of the study area, view towards the north

Figure 27. Western section of the study area, view towards the east

Figure 28. Western section of the study area, view towards the north

Figure 29. Site notice placed on the fence of the western boundary of the study area

Figure 30. Site notice

Figure 31. Site notice placed on the fence of the southern boundary of the study area

Figure 32. Site notice

Figure 33. Modern ruins along the southern boundary of the study area

Figure 34. Modern ruins along the southern boundary of the study area

Figure 35. Bricks scattered along the southern boundary of the study area

Figure 36. Investigating the possibility of this features being a grave, found to be negative

Figure 37. Modern ruins along the southern boundary of the study area

Figure 38. Modern ruins along the southern boundary of the study area

Figure 39. Modern ruins outside the boundaries on the north-eastern side of the study area

Figure 40. Sacred Ibises feeding outside the study area on the north-eastern side

Figure 41. Southern section of the study area, view towards the north

11. Potential Heritage Impacts and Proposed Mitigation

11.1 Introduction and scope

This component will evaluate the potential impact that the proposed development could have on heritage sites and objects of community, cultural or scientific value. This includes archaeological, cultural heritage, built heritage and basic paleontological assessments to determine the impacts on heritage resources within the study area.
The scope of work includes:

- Identification and assessment of archaeological, cultural, historic, built and paleontological sites within the study area
- Interrogation of project specific Drone data and aerial imagery
- Archival study of existing data and information for the study area
- Site inspection and fieldwork: 17 and 18 July 2019. This site work includes communicating with local inhabitants to confirm possible locations of heritage and cultural sites.
- Compilation of a Heritage Impact Assessment (HIA) Report.

11.2 Impact Assessment and Proposed Mitigation

The site was readily accessible, and the confidence level of the provided impact evaluation is as a result high.

Damage to Graves and Burial Sites
None

Table 19. Damage to Graves and Burial Sites

Ref:	1			
Project phase	Construction			
Impact	Damage to Unmarked Grave and Burial Sites			
Description of impact	Construction on the site could physically damage unmarked burial and grave sites.			
Mitigatability	High	Mitigation exists and will considerably reduce the significance of impacts		
Potential mitigation	Chance Finds Protocol to be included in the EMPR			
Assessment	Without mitigation		With mitigation	
Nature	Negative		gative	
Duration	Permanent	Impact may be permanent, or in excess of 20 years	Brief	Impact will not last longer than 1 year
Extent	Limited	Impacts limited to specific parts of the study area	Limited	Impacts limited to specific parts of the study area
Magnitude	High	Natural and/ or social functions and/ or processes are notably altered	Low	Natural and/ or social functions and/ or processes are somewhat altered
Probability	Probable	The impact has occurred here or elsewhere and could therefore occur	Unlikely	Has not happened yet but could happen once in the lifetime of the project, therefore there is a possibility that the impact will occur
Confidence	High	Substantive supportive data exists to verify the assessment	High	Substantive supportive data exists to verify the assessment
Reversibility	Low	The affected environment will not be able to recover from the impact - permanently modified	High	The affected environmental will be able to recover from the impact
Resource irreplaceability	High	The resource is irreparably damaged and is not represented elsewhere	Low	The resource is not damaged irreparably or is not scarce
Significance	Minor - negative		Negligible - negative	
Comment on significance	Chance finds protocol to be applied to any burial sites encountered during the construction phase.			
Cumulative impacts	Extensive agricultural activities in the area could compound this effect.			

Excavation of Palaeontological Materials
Unlikely

Table 20. Excavation of Palaeontological Materials

Ref	3			
Project phase	Construction			
Impact	Excavation of Fossils			
Description of impact	If foundation excavations are to intrude deeper than 10m (the upper ceiling of these deposits) it could unearth fossiliferous materials.			
Mitigatability	High	Mitigation exists and will considerably reduce the significance of impacts		
Potential mitigation	A chance finds protocol for fossils should be included in the ESMP.			
Assessment	Without mitigation		With mitigation	
Nature	Negative		Positive	
Duration	Long term	Impact will last between 10 and 15 years	Short term	Impact will last between 1 and 5 years
Extent	Limited	Impacts limited to specific parts of the study area	Limited	Impacts limited to specific parts of the study area
Magnitude	High	Natural and/ or social functions and/ or processes are notably altered	Low	Natural and/ or social functions and/ or processes are somewhat altered
Probability	Unlikely	Has not happened yet but could happen once in the lifetime of the project, therefore there is a possibility that the impact will occur	Unlikely	Has not happened yet but could happen once in the lifetime of the project, therefore there is a possibility that the impact will occur
Confidence	Medium	Determination is based on common sense and general knowledge	Medium	Determination is based on common sense and general knowledge
Reversibility	Low	The affected environment will not be able to recover from the impact - permanently modified	High	The affected environmental will be able to recover from the impact
Resource irreplaceability	Medium	The resource is damaged irreparably but is represented elsewhere	Medium	The resource is damaged irreparably but is represented elsewhere
Significance	Minor - negative		Negligible - positive	
Comment on significance	Due to the limited research on palaeontology in this area, the recovery of fossils will actually be beneficial to science if the			
Cumulative impacts	Mining activities (prospecting) in the area can result in a cumulative increased impact, but also an expansion of knowledge.			

Damage to Unidentified or Buried Archaeological Sites
Unlikely

Table 21. Damage to Unidentified or Buried Archaeological Sites

Ref:	4			
Project phase	Construction			
Impact	Unidentified/Sub-surface Archaeological Remains			
Description of impact	Archaeological deposits not identified during the fieldwork or which are buried under the predominant and shifting alluvial substrates could be uncovered during the construction activities.			
Mitigatability	High	Mitigation exists and will considerably reduce the significance of impacts		
Potential mitigation	A walkdown survey of the final alignment Chance finds protocol to be included in the EMPR			
Assessment	Without mitigation		With mitigation	
Nature	Negative		Positive	
Duration	Short term	Impact will last between 1 and 5 years	Long term	Impact will last between 10 and 15 years
Extent	Local	Impacts felt mostly throughout the study area	Regional	Impacts felt outside the study area, at a regional / provincial level
Magnitude	High	Natural and/ or social functions and/ or processes are notably altered	Moderate	Natural and/ or social functions and/ or processes are moderately altered
Probability	Unlikely	Has not happened yet but could happen once in the lifetime of the project, therefore there is a possibility that the impact will occur	Likely	The impact may occur
Confidence	Medium	Determination is based on common sense and general knowledge	High	Substantive supportive data exists to verify the assessment
Reversibility	Low	The affected environment will not be able to recover from the impact - permanently modified	High	The affected environmental will be able to recover from the impact
Resource irreplaceability	Medium	The resource is damaged irreparably but is represented elsewhere	Medium	The resource is damaged irreparably but is represented elsewhere
Significance	Negligible - negative		Minor - positive	
Comment on significance	Although information on archaeological sites are scant, there is a possibility of encountering Stone Age and Iron Age sites.			
Cumulative impacts	No cumulative impacts are expected.			

11.3 No-Go Alternative

The no-go option will have the least impact on the heritage components discussed in this report. It is not expected that there will be any significant change in the impact (or lack thereof) in regards to Palaeontological resources.

11.4 Conclusions and Recommendations

The study area was found to be basically devoid of any significant heritage sites. Some modern ruins were observed but for the most part these were out of context and none of the identified structures comprised an occupational or production site.

The palaeontological significance of the site is very high and it is recommended that a field based paleontological study be conducted on site.

It is not anticipated that any sites of heritage significance (with the exclusion of possible paleontological sites) will be impacted upon by the proposed development.

11.5 Chance Finds Protocol

It is important to note that, although unlikely, sub-surface remains of heritage sites could still be encountered during construction of the project. Such sites would offer no surface indication of their presence due to the

high state of alterations in some areas as well as heavy vegetation cover in other areas. The following indicators of unmarked sub-surface sites could be encountered:

- Ash deposits (unnaturally grey appearance of soil compared to the surrounding substrate);
- Bone concentrations, either animal or human;
- Ceramic fragments such as pottery shards either historic or pre-contact;
- Stone concentrations of any formal nature.

The following recommendations are given should any sub-surface remains of heritage sites be identified as indicated above:

- 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.
- All construction in the immediate vicinity (50m radius of the site) should cease.
- The heritage practitioner should be informed as soon as possible.
- Mitigation measures (such as refilling etc.) should not be attempted.
- The area in a 50m radius of the find should be cordoned off with hazard tape.
- Public access should be limited.
- The area should be placed under guard.
- No media statements should be released until such time as the heritage practitioner has had enough time to analyze the finds.

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Appendix 1: Public Participation

G&A Heritage
Heritage Management Consultants

NOTICE OF PHASE 1 HERITAGE IMPACT ASSESSMENT (HIA)

Notice is hereby given that an application for a Phase 1 Heritage Impact Assessment (HIA) in terms of Section 38 of the National Heritage Resources Act (Act 25 of 1999) will be lodged with the Free State Provincial Heritage resources Authority (FSPHRA).

PROJECT NAME: Proposed Township on a Portion of the Farm Klipfontein 716 and Ceres 626, Bloemfontein.

NAME OF PROPONENT: Mangaung Metropolitan Municipality

ANY ENQUIRIES SHOULD BE REFERED TO:

G&A Heritage Properties (Pty) Ltd
Public Participation Registration and Enquiries
Lesley Gaigher
lesley@gaheritage.co.za
0825515082
PO Box 522
Louis Trichardt
0920

Vorster Street 38 A, Louis Trichardt, 0920, South Africa
PO Box 522, Louis Trichardt, 0920
Tel +27 15 516 1561 Cell +27 73 752 6585

Figure 42. Site Notice

BACKGROUND INFORMATION DOCUMENT

Proposed New Township Development on a Portion of the Farm Klipfontein 716 and the Farm Ceres 626 near Bloemfontein in the Mangaung Metropolitan Municipality, Free State Province.

38A Vorster street
Louis Trichardt, 0920

Phone: +27 (015) 516 1561
Cell: +27 (0) 82 551 5082
Email: lesley@gaheritage.co.za
www.gaheritage.co.za

2

Background Information Document

Purpose of this Document

This Background Information Document (BID) provides Interested and Affected Parties (I&APs) with information on the Heritage Impact Assessment (HIA) being done by G&A Heritage Properties (Pty) LTD for the Heritage Impact Assessment for the proposed new township development located on a portion of the farm Klipfontein 716 and the farm Ceres 626 near Bloemfontein in the Mangaung Metropolitan Municipality in the Free State Province.

This BID provides I&APs with the opportunity to register as stakeholders in this process; and comment on the proposed projects. The purpose of a HIA is to identify and evaluate potential impacts, to recommend measures to avoid or reduce negative impacts and to enhance positive impacts. The decision-making authority for this HIA is the South African Heritage Resources Agency (SAHRA) and the Free State Provincial Heritage Resource Authority (FSPHRA).

You will be included in the stakeholder database and receive further documents for review and comment/s. Your comments will ensure that all issues of concern are addressed. To raise your concerns, complete the enclosed registration sheet, write a letter, call or email the public participation office.

Contact Information
G&A Heritage Properties (Pty) LTD
Lesley Gaigher
Tel +27 (015) 516 1561 / +27 (0) 82 551 5082
Email: lesley@gaheritage.co.za
Postal Address: 38A Vorster Street, Louis Trichardt, 0920, South Africa

3

HERITAGE IMPACT ASSESSMENT FOR THE PROPOSED NEW TOWNSHIP DEVELOPMENT IN THE MANGAUNG METROPOLITAN MUNICIPALITY

THE DEADLINE FOR RECEIPT OF COMMENTS AND REGISTRATION AS AN IAP IS 2019/08/19.

Participation should be free, and you may submit any comments or information you feel may be useful to the HIA. Registered interested and affected parties are entitled to comment, in writing, on all written submissions to the competent authority (SAHRA & FSPHRA) as well as any issues which the party believes may be of significance to the consideration of the application.
Please find attached to this BID a comment sheet to complete, should you wish to comment on the above.

4

Heritage Impact Assessment (HIA)

A Heritage Impact Assessment is a study to determine the impact of a proposed development on the cultural heritage value of a property and to recommend an overall approach to the conservation of the heritage resources. This information is then used by the competent authorities to compile a Record of Decision (RoD) regarding the impact of the development on the area's cultural heritage. At the very least the HIA should;

- Identify the potential impacts of the proposed development;
- Record the issues, concerns and suggestions raised by I&APs; and
- Outline mitigation measures to be taken to avoid or reduce negative impacts and enhance positive impacts.

HIA Stakeholder Engagement Phase

As an important part of the HIA for the proposed project, G&A Heritage Properties (Pty) Ltd. will also conduct the stakeholder engagement and public participation component. This will enable stakeholders to influence the course of the investigations and to review the findings of the independent study that is to be undertaken. The steps of the public participation component are outlined below. The following steps will be taken in this regard:

- Advertising - public notices in regional and local newspapers;
- Placement of these site notices around the sites being investigated;
- Supplying adjacent landowners with this Background Information Document (BID);
- Contacting stakeholders and notifying them of the process;
- Documenting stakeholder correspondence within the Draft HIA that will be made available for public review; and
- Notifying stakeholders when the Record of Decision (RoD) is issued by SAHRA & FSPHRA as well as the appeals process open to them.

HIA Reports

- ✓ The Draft Heritage Impact Assessment Report (DHIAR) will be made available for a period of four weeks. Registered IAP's will then have the opportunity to comment on the findings of the report.
- ✓ The Final Heritage Impact Assessment Report (FHIAR) will be compiled to incorporate and address any comments received during the stakeholder engagement phase.

Final Notification by Authorities

Once the relevant authorities SAHRA & FSPHRA, has issued the RoD, I&APs will be notified of the decision and what procedure to follow should they wish to appeal the RoD. There will be a 14-day appeal period available for this.

6

HIA QUESTIONNAIRE

PROPOSED NEW TOWNSHIP DEVELOPMENT IN THE MANGAUNG METROPOLITAN MUNICIPALITY

Your comments on this questionnaire will contribute towards ensuring that the process which is applied to direct the Heritage Impact Assessment (HIA) is sound and will permit an informed project decision to be taken.

Correspondent to complete the following:

Title & Name:	
Address:	
Phone/email:	

By completing this questionnair you indicate that the information provided was done so at your own will and not under duress.

THE DEADLINE FOR THE RECEIPT OF COMMENTS IS 19th OF AUGUST 2019.

1. Are there any concerns that you feel the heritage team should be aware about in terms of heritage preservation of significance within the study area?

2. Would you like to nominate further IAP's that you feel should be involved in this process? (Please provide adequate contact details in order for us to contact I&AP).

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3. Do you feel that the HIA performed upholds the requirements of the NHRA no 25 of 1999 and the minimum standards as set out by SAHRA for HIA reports?

Yes ☐

No ☐ *(if no, please give a short explanation below)*

Thank you for taking the time to complete this questionnaire. Your views and opinions are important to us and ensures the protection of our cultural heritage. Please feel free to attach further pages to this questionnaire if needed.

YOUR COMMENTS SHOULD BE SENT TO:

G&A HERITAGE PROPERTIES (PTY) LTD

Lesley Gaigher
Tel. +27 (015) 516 1561 / +27 (0) 82 551 5082
Email: lesley@gaheritage.co.za
Postal Address: 38A Vorster street, Louis Trichardt, 0920, South Africa

www.gaheritage.co.za

Figure 43. BID

APPENDIX D3.1: PALEONTOLOGICAL ASSESSMENT REPORT

PALAEONTOLOGICAL IMPACT ASSESSMENT FOR THE PROPOSED TOWNSHIP DEVELOPMENT ON PORTION OF THE FARM KLIPFONTEIN 716 AND FARM CERES 626, BLOEMFONTEIN, MANGAUNG METROPOLITAN MUNICIPALITY, FREE STATE

CaseID: 15154

Compiled for:

Ngoti Development Consultants
Boardwalk Office Park
Block 9 unit 2
6 Eros Road
Fearie Glen

Prepared by

Banzai Environmental

18 July 2020

Declaration of Independence

I, Elize Butler, declare that –

General declaration:

- I act as the independent palaeontological specialist in this application
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favorable to the applicant
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting palaeontological impact assessments, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, Regulations and all other applicable legislation;
- I will take into account, to the extent possible, the matters listed in section 38 of the NHRA when preparing the application and any report relating to the application;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- I will ensure that information containing all relevant facts in respect of the application is distributed or made available to interested and affected parties and the public and that participation by interested and affected parties is facilitated in such a manner that all interested and affected parties will be provided with a reasonable opportunity to participate and to provide comments on documents that are produced to support the application;
- I will provide the competent authority with access to all information at my disposal regarding the application, whether such information is favorable to the applicant or not
- All the particulars furnished by me in this form are true and correct;
- I will perform all other obligations as expected a palaeontological specialist in terms of the Act and the constitutions of my affiliated professional bodies; and
- I realize that a false declaration is an offense in terms of regulation 71 of the Regulations and is punishable in terms of section 24F of the NEMA.

Disclosure of Vested Interest

I do not have and will not have any vested interest (either business, financial, personal or other) in the proposed activity proceeding other than remuneration for work performed in terms of the Regulations;

PALAEONTOLOGICAL CONSULTANT: Banzai Environmental (Pty) Ltd

CONTACT PERSON: Elize Butler

Tel: +27 844478759

Email: elizebutler002@gmail.com

SIGNATURE: 

This Palaeontological Impact Assessment report has been compiled considering the National Environmental Management Act 1998 (NEMA) and Environmental Impact Regulations 2014 as amended, requirements for specialist reports, Appendix 6, as indicated in the table below.

Table 1 - NEMA Table

Requirements of Appendix 6 – GN R326 EIA Regulations of 7 April 2017	**Relevant section in report**	**Comment where not applicable.**
1.(1) (a) (i) Details of the specialist who prepared the report	Page 8 and Section 2 of Report – Contact details and company and Appendix A	-
(ii) The expertise of that person to compile a specialist report including a curriculum vita	**Appendix A**	-
(b) A declaration that the person is independent in a form as may be specified by the competent authority	Page 1 of the report	-
(c) An indication of the scope of, and the purpose for which, the report was prepared	Section 4 – Objective	-
(cA) An indication of the quality and age of base data used for the specialist report	Section 5 – Geological and Palaeontological history	-
(cB) a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	Section 10	-
(d) The duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment	Section 1 and 11	
(e) a description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used	Section 7 Approach and Methodology	-
(f) details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure, inclusive of a site plan identifying site alternatives;	Section 1 and 11	
(g) An identification of any areas to be avoided, including buffers		No buffers or areas o sensitivity identified
(h) A map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	Section 5 – Geological and Palaeontological history	
(i) A description of any assumptions made and any uncertainties or gaps in knowledge;	Section 7.1 – Assumptions and Limitation	-
(j) A description of the findings and potential implications of such findings on the impact of the proposed activity, including identified alternatives, on the environment	Section 1 and 11	
(k) Any mitigation measures for inclusion in the EMPr	Section 12	
(l) Any conditions for inclusion in the environmental authorisation	Section 12	

Requirements of Appendix 6 – GN R326 EIA Regulations of 7 April 2017	Relevant section in report	Comment where not applicable.
(m) Any monitoring requirements for inclusion in the EMPr or environmental authorisation	N/A	
(n)(i) A reasoned opinion as to whether the proposed activity, activities or portions thereof should be authorised and		
(n)(iA) A reasoned opinion regarding the acceptability of the proposed activity or activities; and	Section 1 and 11	
(n)(ii) If the opinion is that the proposed activity, activities or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan	Section 1 and 11	-
(o) A description of any consultation process that was undertaken during the course of carrying out the study		Not applicable. A public consultation process was handled as part of the Environmental Impact Assessment (EIA) and Environmental Management Plan (EMP) process.
(p) A summary and copies if any comments that were received during any consultation process	N/A	Not applicable. To date no comments regarding heritage resources that require input from a specialist have been raised.
(q) Any other information requested by the competent authority.	N/A	Not applicable.
(2) Where a government notice by the Minister provides for any protocol or minimum information requirement to be applied to a specialist report, the requirements as indicated in such notice will apply.	Section 3 compliance with SAHRA guidelines	

EXECUTIVE SUMMARY

Banzai Environmental was appointed by Ngoti development consultants to conduct the Palaeontological Impact Assessment (PIA) to assess the proposed new Township development on portion of the farm Klipfontein 716 and farm Ceres 626 in Bloemfontein, Mangaung Metropolitan Municipality, Free State. The National Heritage Resources Act (No 25 of 1999, section 38) (NHRA), states that a PIA is necessary to identify the presence of fossil material within the planned development footprint. This PIA is thus necessary to evaluate the effect of the construction on the palaeontological resources.

The proposed new Township development on portion of the farm Klipfontein 716 and farm Ceres 626 in Bloemfontein, Mangaung Metropolitan Municipality, Free State is underlain by the Adelaide Subgroup, Balfour Formation of the Karoo Supergroup. According to the PalaeoMap of South African Heritage Resources Information System the Palaeontological Sensitivity of the Adelaide Subgroup is Very High (Almond *et al*, 2013; SAHRIS website; Figure 6).

A site-specific field survey of the development footprint was conducted on foot and by motor vehicle on 18 July 2020. No visible evidence of fossiliferous outcrops was found. The scarcity of fossil heritage at the proposed development footprint indicates that the impact of the proposed new Township development in Bloemfontein will be of a low significance in palaeontological terms. Thus, the construction and development may be authorised in its whole extent, as the development footprint is not considered sensitive in terms of palaeontological resources.

If fossil remains are discovered during any phase of construction, either on the surface or exposed by excavations the **Chance Find Protocol** must be implemented by the Environmental Control Officer (ECO) in charge of these developments. These discoveries ought to be protected (if possible, *in situ*) and the ECO must report to SAHRA (Contact details: SAHRA, 111 Harrington Street, Cape Town. PO Box 4637, Cape Town 8000, South Africa. Tel: 021 462 4502. Fax: +27 (0)21 462 4509. Web: www.sahra.org.za) so that correct mitigation (recording and collection) can be carry out by a paleontologist.

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Appendix A: CV

1 INTRODUCTION

Mangaung Metropolitan Municipality proposes the development of a new township development on portion of the farm Klipfontein 716 and farm Ceres 626 in Bloemfontein, Mangaung Metropolitan Municipality, Free State (Figure 1-3). Ngoti Development appointed Inaluk Consulting Service to conduct the EIA for the authorisation of the proposed development.

2 QUALIFICATIONS AND EXPERIENCE OF THE AUTHOR

The author (Elize Butler) has an MSc in Palaeontology from the University of the Free State, Bloemfontein, South Africa. She has been working in Palaeontology for more than twenty-four years. She has extensive experience in locating, collecting and curating fossils, including exploration field trips in search of new localities in the Karoo Basin. She has been a member of the Palaeontological Society of South Africa for 14 years. She has been conducting Palaeontological Impact Assessments (PIA) since 2014.

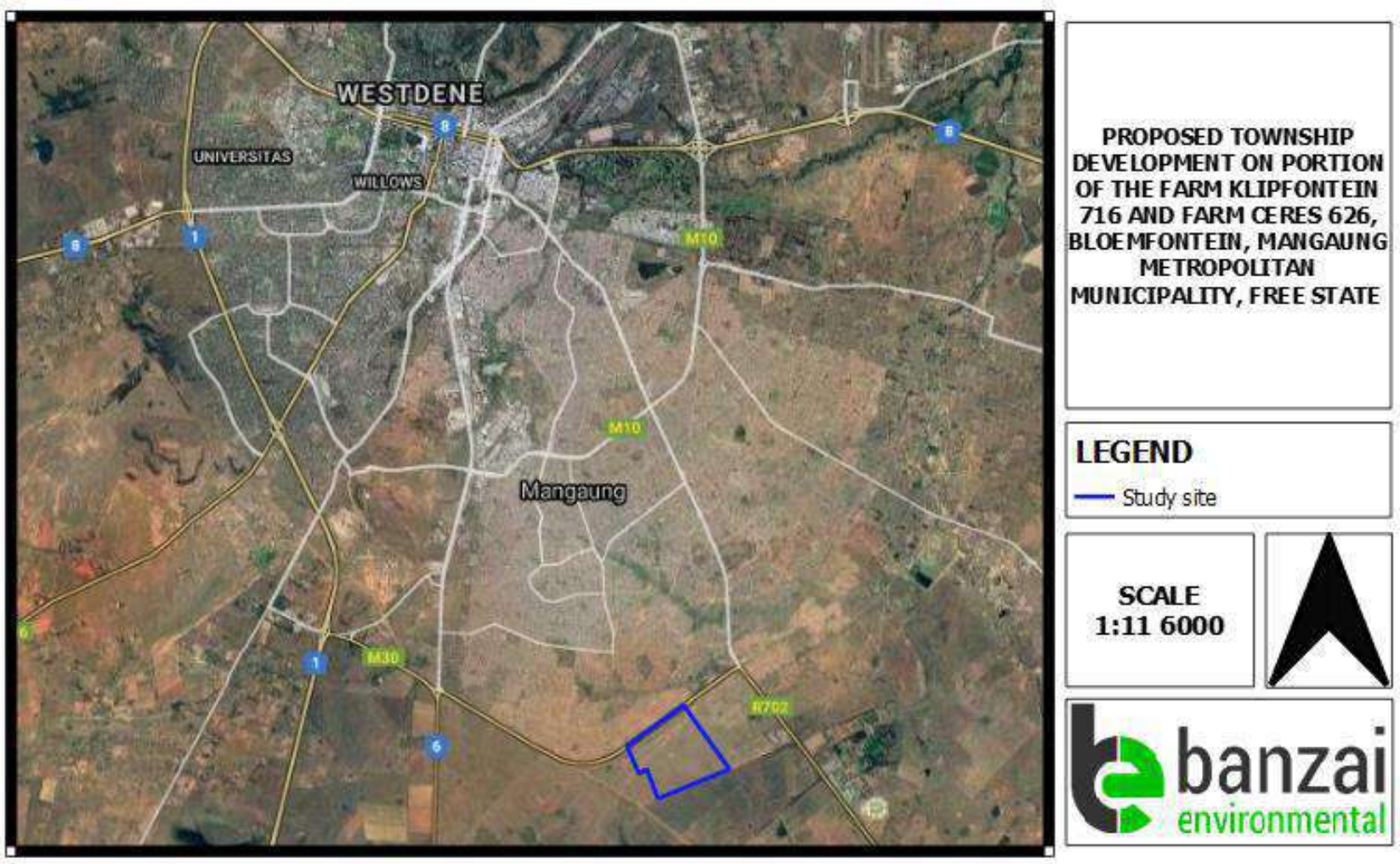

Figure 1 *–Google Earth Image (2020) indicating the Regional setting of the proposed* new township development on portion of the farm Klipfontein 716 and farm Ceres 626 in Bloemfontein, Mangaung Metropolitan Municipality, Free State.

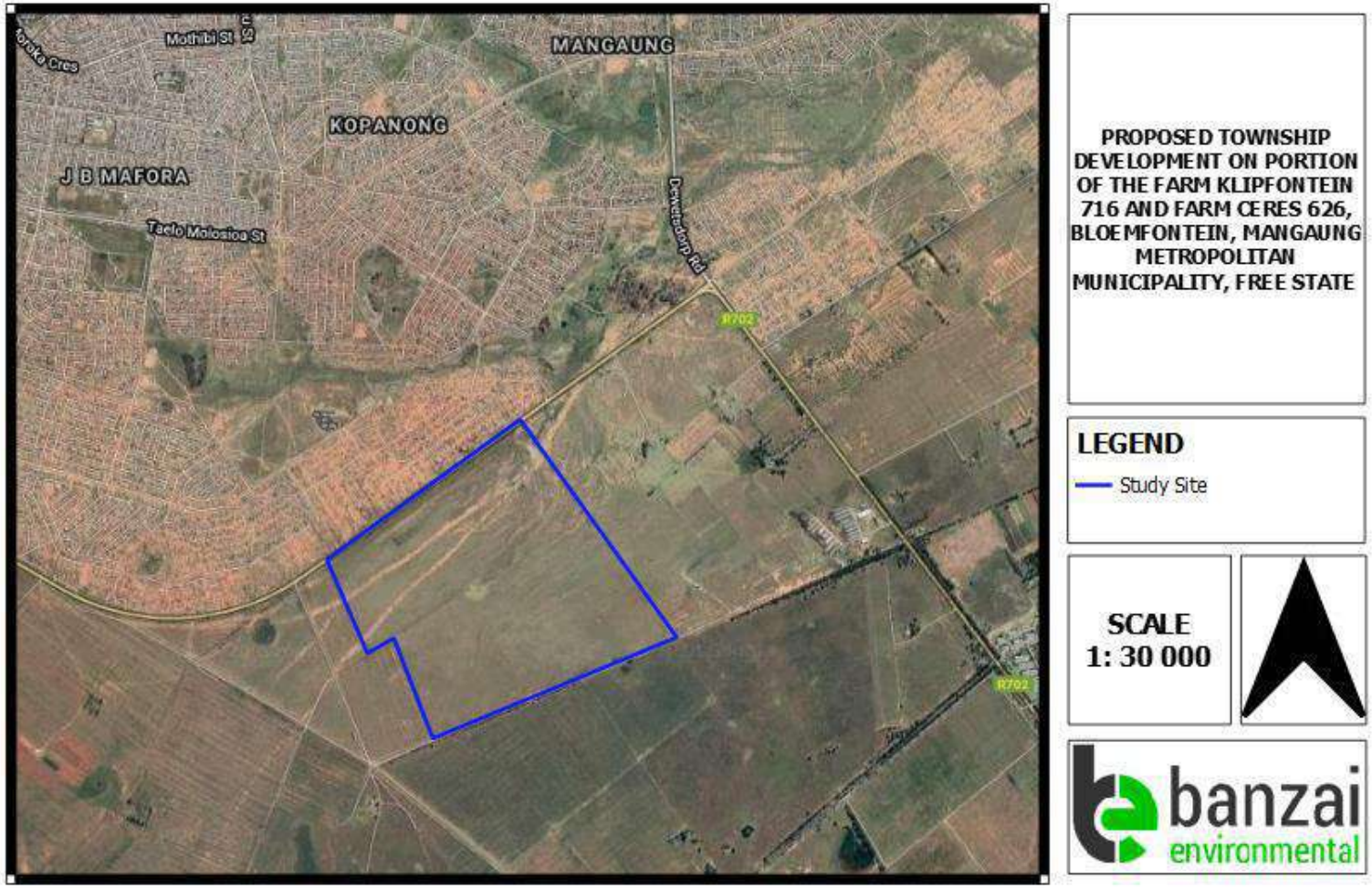

Figure 2 *– Close up Google Earth Image (2020) Google Earth Image (2020) indicating the Regional setting of the proposed* new township development on portion of the farm Klipfontein 716 and farm Ceres 626 in Bloemfontein, Mangaung Metropolitan Municipality, Free State.

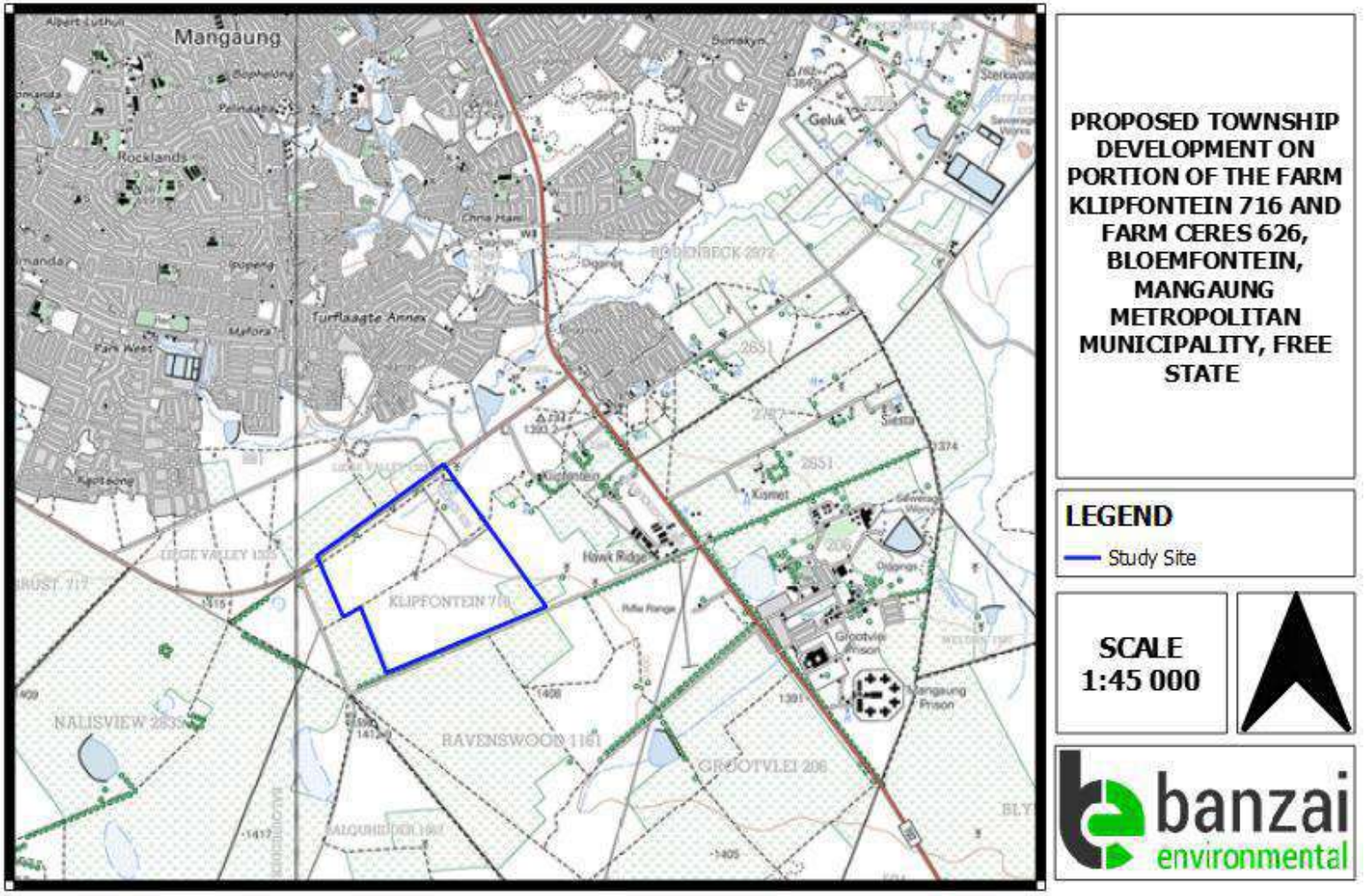

Figure 3 *– Local setting.*

3 LEGISLATION

3.1 National Heritage Resources Act (25 of 1999)

Cultural Heritage in South Africa, includes all heritage resources, is protected by the National Heritage Resources Act (Act 25 of 1999) (NHRA). Heritage resources as defined in Section 3 of the Act include **"all objects recovered from the soil or waters of South Africa, including archaeological and palaeontological objects and material, meteorites and rare geological specimens**".

Palaeontological heritage is exceptional and non-renewable and is protected by the NHRA. Palaeontological resources and may not be unearthed, broken moved, or destroyed by any development without prior assessment and without a permit from the relevant heritage resources authority as per section 35 of the NHRA.

This PIA forms part of the Heritage Impact Assessment (HIA) and adhere to the conditions of the Act. According to **Section 38 (1)**, an HIA is required to assess any potential impacts to palaeontological heritage within the development footprint where:

- the construction of a road, wall, power line, pipeline, canal or other similar form of linear development or barrier exceeding 300 m in length;
- the construction of a bridge or similar structure exceeding 50 m in length;
- any development or other activity which will change the character of a site—
- (exceeding 5 000 m^2 in extent; or
- involving three or more existing erven or subdivisions thereof; or
- involving three or more erven or divisions thereof which have been consolidated within the past five years; or
- the costs of which will exceed a sum set in terms of regulations by SAHRA or a provincial heritage resources authority
- the re-zoning of a site exceeding 10 000 m^2 in extent;
- or any other category of development provided for in regulations by SAHRA or a Provincial heritage resources authority.

4 OBJECTIVE

The aim of a PIA is to decrease the effect of the development on potential fossils at the development site.

According to the "SAHRA APM Guidelines: Minimum Standards for the Archaeological and Palaeontological Components of Impact Assessment Reports" the purpose of the Paleontological

Impact Assessment (PIA) are: 1) to **identify** the palaeontological importance of the rock formations in the footprint; 2) to evaluate the palaeontological magnitude of the formations; 3) to determine the **impact** on fossil heritage; and 4) to **recommend** how the property developer should guard against and lessen damage to fossil heritage.

The terms of reference of a PIA are as follows:

General Requirements:

- Adherence to the content requirements for specialist reports in accordance with Appendix 6 of the EIA Regulations 2014, as amended.
- Adherence to all applicable best practice recommendations, appropriate legislation and authority requirements.
- Submit a comprehensive overview of all appropriate legislation, guidelines.
- Description of the proposed project and provide information regarding the developer and consultant who commissioned the study.
- Description and location of the proposed development and provide geological and topographical maps.
- Provide Palaeontological and geological history of the affected area.
- Identification sensitive areas to be avoided (providing shapefiles/kml's) in the proposed development.
- Evaluation of the significance of the planned development during the Pre-construction, Construction, Operation, Decommissioning Phases and Cumulative impacts. Potential impacts should be rated in terms of the direct, indirect and cumulative:
    a. **Direct impacts** are impacts that are caused directly by the activity and generally occur at the same time and at the place of the activity.
    b. **Indirect impacts** of an activity are indirect or induced changes that may occur as a result of the activity.
    c. Cumulative impacts result from the incremental impact of the proposed activity on a common resource when added to the impacts of other past, present or reasonably foreseeable future activities.
- Fair assessment of alternatives (infrastructure alternatives have been provided):
- Recommend mitigation measures to minimise the impact of the proposed development; and

Implications of specialist findings for the proposed development (such as permits, licenses etc).

5 GEOLOGICAL AND PALAEONTOLOGICAL HISTORY

The proposed new Township development on portion of the farm Klipfontein 716 and farm Ceres 626 in Bloemfontein, Mangaung Metropolitan Municipality, Free State is depicted on the 1:250 000 2926 Bloemfontein Geological Map (Council of Geosciences). The proposed new township development is underlain by Adelaide Subgroup, Balfour Formation of the Karoo Supergroup (Table 2, Figure 4-5). According to the PalaeoMap of South African Heritage Resources Information System the Palaeontological Sensitivity of the Adelaide Subgroup is Very High (Almond *et al*, 2013; SAHRIS website; Figure 6). The Balfour Formation forms the upper part of the Adelaide Subgroup and part of what was called lower to middle Beaufort. The proposed development falls in the *Daptocephalus* Assemblage Zone (Figure 4).

Table 2: Stratigraphy of the Adelaide Subgroup

<table>
<tr><th>Period</th><th>Supergroup</th><th>Group</th><th>Subgroup</th><th>Formation West of 24º E</th><th>Formation East of 24º E</th></tr>
<tr><td rowspan="3">Middle Permian - Middle Triassic</td><td rowspan="3">Karoo Supergroup</td><td rowspan="3">Beaufort Group</td><td rowspan="3">Adelaide Subgroup</td><td></td><td rowspan="2">Balfour Formation</td></tr>
<tr><td rowspan="2">Teekloof Formation</td></tr>
<tr><td>Middleton Formation</td></tr>
<tr><td></td><td>Abrahamskraal Formation</td><td>Koonop Formation</td></tr>
</table>

The proposed township development in Bloemfontein is underlain by a series of Karoo sandstones, mudstones and shales, deposited under fluvial environments of the Adelaide Subgroup that forms part of the Beaufort Group. The Beaufort Group is the third of the main subdivisions of the Karoo Supergroup. The Beaufort group overlays the Ecca Group and consists essentially of sandstones and shales, deposited in the Karoo Basin from the Middle Permian to the early part of the Middle Triassic periods and was deposited on land through alluvial processes. The Beaufort Group covers a total land surface area of approximately 200 000 km^2 in South Africa and is the first fully continental sequence in the Karoo Supergroup. This Group is divided into the Adelaide subgroup and the overlying Tarkastad subgroup. The Adelaide subgroup rocks are deposited under a humid climate that allowed for the establishment of wet floodplains with high water tables and are interpreted to be fluvio-lacustrine sediments.

Stratigraphy

In the south eastern portion of the Karoo Basin the Adelaide Subgroup consists of the Koonap, Middleton and Balfour Formations. West of 24° the Adelaide Subgroup is represented by the Abrahamskraal and Teekloof Formations and in the north the Group is represented by the Normandien Formation. The Adelaide Subgroup is approximately 5 000 m thick in the southeast but decreases to about 800 m in the centre of the basin which thinness out to about 100 to 200m in the north. The Koonop

Formation is about 1 300 m, Middleton 1 600 m and the Balfour Formation approximately 200 m thick. The Abrahamskraal Formation is about 2 500 m thick and the Teekloof Formation 1 000 m. The Normandien Formation is only about 320 m thick.

The Adelaide Subgroup contains alternating greyish-red, bluish-grey, or greenish-grey mudrocks in the southern and central parts of the Karoo Basin with very fine to medium grained, grey lithofeldspathic sandstones. Singular sandstone units could vary from 6 meters to 60 meters in the south thinning northwards. Thicker sandstones of the Adelaide are usually multi-storey and usually have cut-and fill features. The sandstones are characterized internally by horizontal lamination together with parting lineation and less frequent trough crossbedding as well as current ripple lamination. The bases of the sandstone units are massive beds, while ripple lamination is usually confined to thin sandstones towards the top of the thicker units.

The *Daptocephalus* Assemblage Zone of the Beaufort Group shows the greatest vertebrate diversity and includes numerous well-preserved genera and species of dicynodonts, biarmosuchians, gorgonopsian, therocephalian and cynodont therapsid Synapsida as well as captorhinid Reptilia and less well represented eosuchian Reptilia, Amphibia and Pisces. Trace fossils of vertebrates and invertebrates as well as Glossopteris flora plants have also been described (Abdala *et* al, 2006; Botha *et al*, 2007; Damiani *et al*, 2003, Modesto *et al*, 2010, Smith et al, 2005).

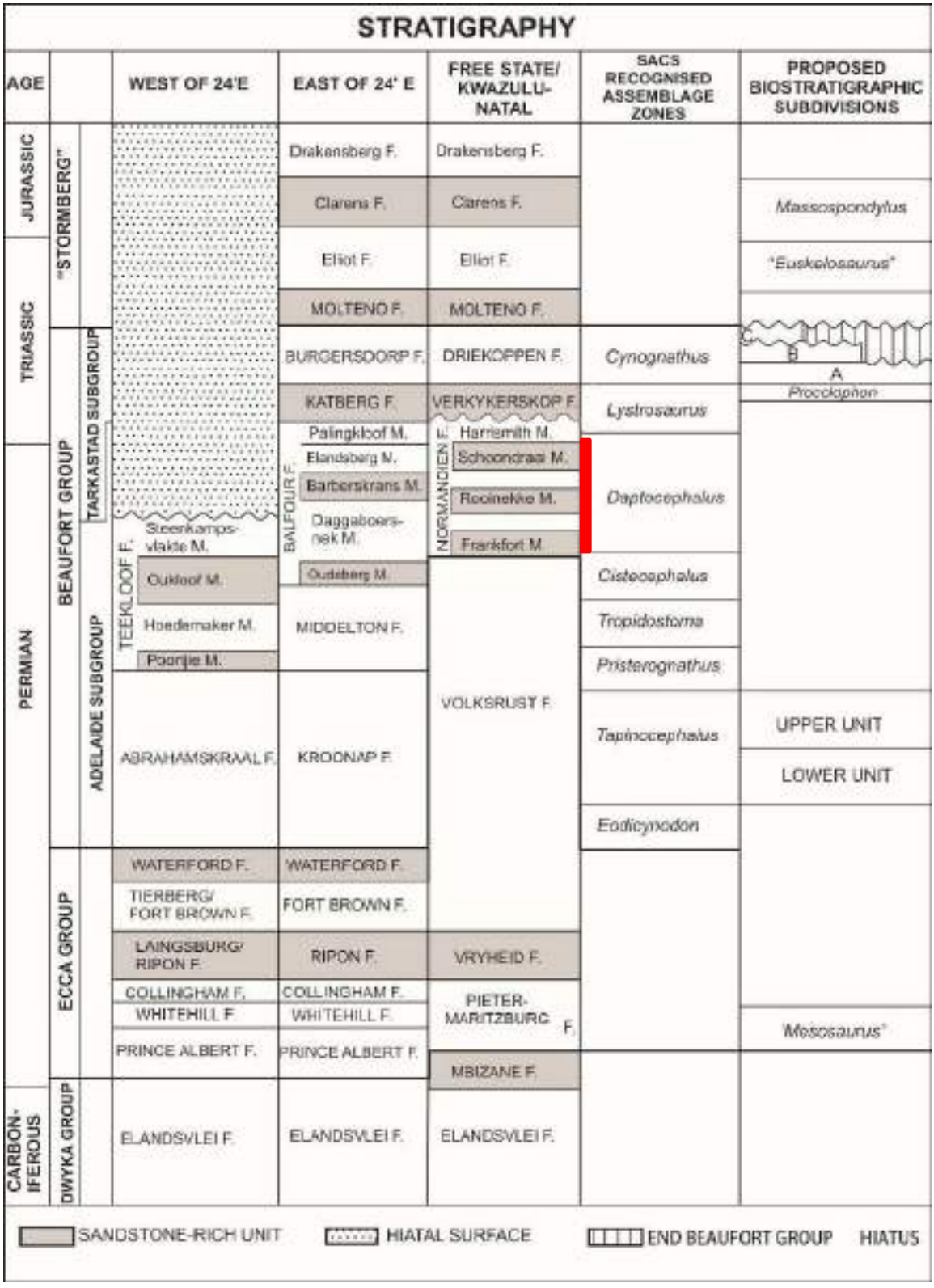

***Figure 4**: Lithostratigraphic (rock-based) and biostratigraphic (fossil-based) subdivisions of the Beaufort Group with rock units and fossil assemblage zones relevant to the present study marked in blue (Modified from Rubidge 1995). The subdivisions of the Beaufort Group include the Adelaide and Tarkastad Subgroups and range in age from Late Permian to Middle Triassic. Abbreviations: F. = Formation, M. = Member.*

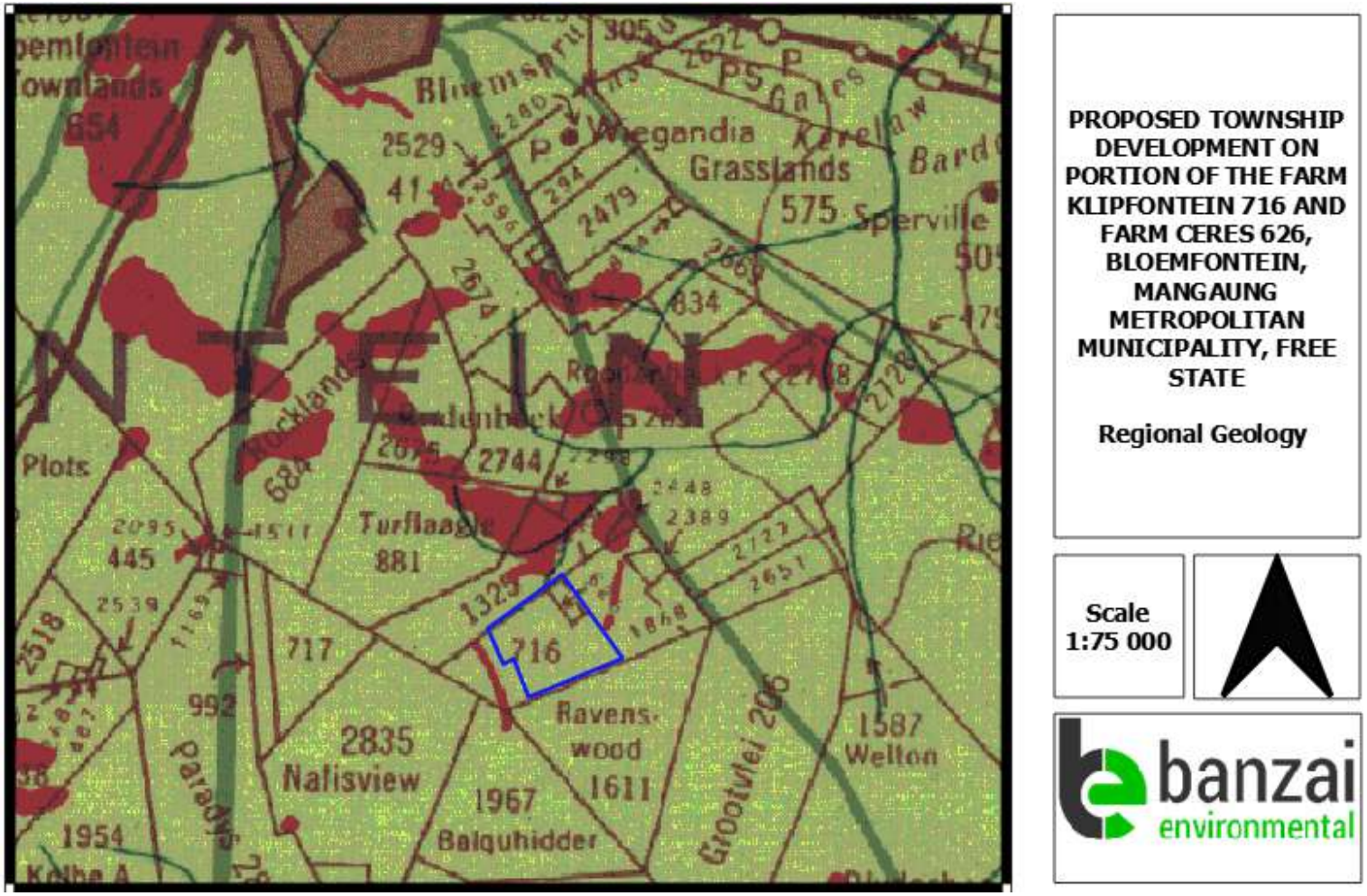

Figure 5 - *Extract of the 1: 250 000* 2926 Bloemfontein Geological Map (Council of Geosciences, Pretoria). The study area is underlain by the Adelaide Subgroup, Balfour Formation of the Karoo Supergroup.

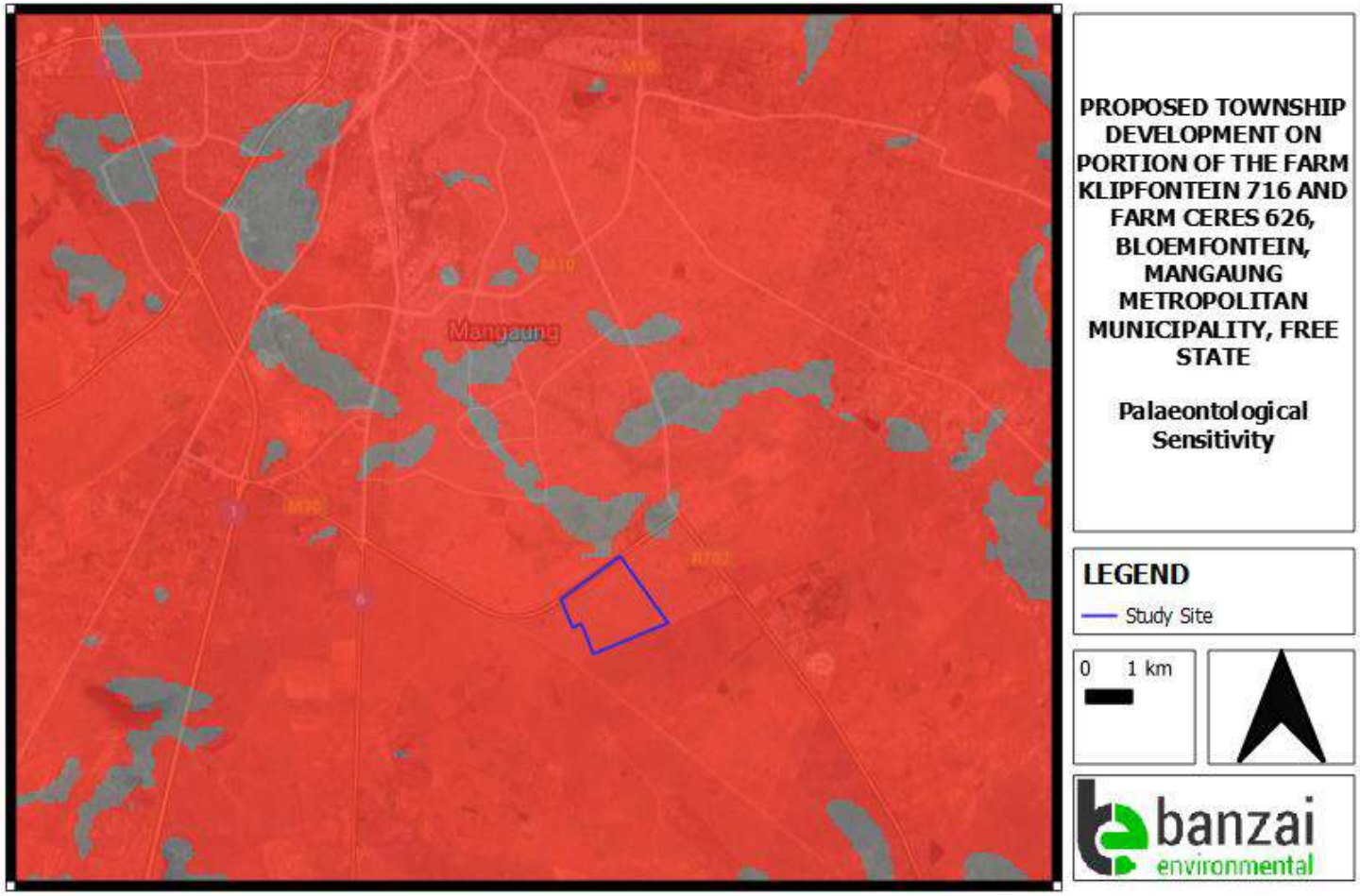

Figure 6 *- Extract of the 1 in 250 000 SAHRIS PalaeoMap map (Council of Geosciences) indicating the locality of the proposed development.*

Colour	Sensitivity	Required Action
RED	VERY HIGH	field assessment and protocol for finds is required
ORANGE/YELLOW	**HIGH**	**desktop study is required and based on the outcome of the desktop study; a field assessment is likely**
GREEN	MODERATE	desktop study is required
BLUE	LOW	no palaeontological studies are required however a protocol for finds is required
GREY	**INSIGNIFICANT/ZERO**	**no palaeontological studies are required**
WHITE/CLEAR	UNKNOWN	these areas will require a minimum of a desktop study. As more information comes to light, SAHRA will continue to populate the map.

According to the SAHRIS Palaeosensitivity map (Figure **6**6) there is a Very High chance of finding fossils in this area.

6 GEOGRAPHICAL LOCATION OF THE SITE

The proposed township development on portion of the farm Klipfontein 716 and farm Ceres 626 in Bloemfontein, Mangaung Metropolitan Municipality, Free State and is situated across the road from an already established township area (near Kopanong) which is almost 214,1 ha in extent. The site is next to the Dewetsdorp Road (Figure 1-3). The proposed development is about 17 km from Bloemfontein central.

7 METHODS

The aim of a PIA is to evaluate the risk to palaeontological heritage in the proposed development. This include all trace fossils and fossils. All available information is consulted to compile a desktop study and includes: PIA reports in the same area; aerial photos and Google Earth images, topographical as well as geological maps.

7.1 Assumptions and Limitations

When conducting a PIA several factors can affect the accuracy of the assessment. The focal point of geological maps is the geology of the area and the sheet explanations were not meant to focus on palaeontological heritage. Many inaccessible regions of South Africa have not been reviewed by

palaeontologists and data is generally based on aerial photographs. Locality and geological information of museums and universities databases have not been kept up to date or data collected in the past have not always been accurately documented.

Comparable Assemblage Zones in other areas is used to provide information on the existence of fossils in an area which was not yet been documented. When similar Assemblage Zones and geological formations for Desktop studies is used it is generally **assumed** that exposed fossil heritage is present within the footprint. A field-assessment is thus necessary to improve the accuracy of the desktop assessment

8 ADDITIONAL INFORMATION CONSULTED

In compiling this report the following sources were consulted:

- Geological map 1:100 000, Geology of the Republic of South Africa (Visser 1984)
- 1: 250 000 2926 Bloemfontein Geological Map (Council of Geosciences, Pretoria).
- A Google Earth map with polygons of the proposed development was obtained from Inaluk Consulting Service

9 SITE VISIT

A one-day site specific field survey of the development footprint was conducted on foot and by motor vehicle on 18 July 2020. The following photographs were taken during the site visit to the proposed development. No fossiliferous outcrop was identified during the site visit. Well-preserved fossils may be found during excavations and due care must be taken to preserve them- see protocol for finds.

Figure 7 – *View from the southern corner overlooking the proposed new township development.*

Figure 8 – Centre of the proposed development.

Figure 9 – South-eastern border of the proposed development.

Figure 10 – Northern corner of the proposed development.

Figure 11 – View from the north-western border overlooking the proposed development.

10 IMPACT ASSESSMENT METHODOLOGY AND HIERARCHY

10.1 Impact Rating System

Impact assessment must take account of the nature, scale and duration of impacts on the environment whether such impacts are positive or negative. Each impact is also assessed according to the following project phases:

- Construction
- Operation
- Decommissioning

Where necessary, the proposal for mitigation or optimisation of an impact should be detailed. A brief discussion of the impact and the rationale behind the assessment of its significance should also be included. The rating system is applied to the potential impacts on the receiving environment and includes an objective evaluation of the mitigation of the impact. In assessing the significance of each impact the following criteria is used:

Table 3:*The rating system*

NATURE		
Include a brief description of the impact of environmental parameter being assessed in the context of the project. This criterion includes a brief written statement of the environmental aspect being impacted upon by a particular action or activity.		
GEOGRAPHICAL EXTENT		
This is defined as the area over which the impact will be experienced.		
1	Site	The impact will only affect the site.
2	Local/district	Will affect the local area or district.
3	Province/region	Will affect the entire province or region.
4	International and National	Will affect the entire country.
PROBABILITY		
This describes the chance of occurrence of an impact.		
1	Unlikely	The chance of the impact occurring is extremely low (Less than a 25% chance of occurrence).
2	Possible	The impact may occur (Between a 25% to 50% chance of occurrence).
3	Probable	The impact will likely occur (Between a 50% to 75% chance of occurrence).
4	Definite	Impact will certainly occur (Greater than a 75% chance of occurrence).

Table 1 Continues

DURATION		
This describes the duration of the impacts. Duration indicates the lifetime of the impact as a result of the proposed activity.		
1	Short term	The impact will either disappear with mitigation or will be mitigated through natural processes in a span shorter than the construction phase (0 – 1 years), or the impact will last for the period of a relatively short construction period and a limited recovery time after construction, thereafter it will be entirely negated (0 – 2 years).
2	Medium term	The impact will continue or last for some time after the construction phase but will be mitigated by direct human action or by natural processes thereafter (2 – 10 years).
3	Long term	The impact and its effects will continue or last for the entire operational life of the development, but will be

		mitigated by direct human action or by natural processes thereafter (10 – 30 years).
4	Permanent	The only class of impact that will be non-transitory. Mitigation either by man or natural process will not occur in such a way or such a time span that the impact can be considered indefinite.
INTENSITY/ MAGNITUDE		
Describes the severity of an impact.		
1	Low	Impact affects the quality, use and integrity of the system/component in a way that is barely perceptible.
2	Medium	Impact alters the quality, use and integrity of the system/component but system/component still continues to function in a moderately modified way and maintains general integrity (some impact on integrity).
3	High	Impact affects the continued viability of the system/ component and the quality, use, integrity and functionality of the system or component is severely impaired and may temporarily cease. High costs of rehabilitation and remediation.
4	Very high	Impact affects the continued viability of the system/component and the quality, use, integrity and functionality of the system or component permanently ceases and is irreversibly impaired. Rehabilitation and remediation often impossible. If possible rehabilitation and remediation often unfeasible due to extremely high costs of rehabilitation and remediation.

Table 1 Continues

REVERSIBILITY		
This describes the degree to which an impact can be successfully reversed upon completion of the proposed activity.		
1	Completely reversible	The impact is reversible with implementation of minor mitigation measures.
2	Partly reversible	The impact is partly reversible but more intense mitigation measures are required.
3	Barely reversible	The impact is unlikely to be reversed even with intense mitigation measures.
4	Irreversible	The impact is irreversible and no mitigation measures exist.

IRREPLACEABLE LOSS OF RESOURCES		
This describes the degree to which resources will be irreplaceably lost as a result of a proposed activity.		
1	No loss of resource	The impact will not result in the loss of any resources.
2	Marginal loss of resource	The impact will result in marginal loss of resources.
3	Significant loss of resources	The impact will result in significant loss of resources.
4	Complete loss of resources	The impact is result in a complete loss of all resources.
CUMULATIVE EFFECT		
This describes the cumulative effect of the impacts. A cumulative impact is an effect which in itself may not be significant but may become significant if added to other existing or potential impacts emanating from other similar or diverse activities as a result of the project activity in question.		
1	Negligible cumulative impact	The impact would result in negligible to no cumulative effects.
2	Low cumulative impact	The impact would result in insignificant cumulative effects.
3	Medium cumulative impact	The impact would result in minor cumulative effects.
4	High cumulative impact	The impact would result in significant cumulative effects

Table 1 Continues

SIGNIFICANCE		
Significance is determined through a synthesis of impact characteristics. Significance is an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required. The calculation of the significance of an impact uses the following formula: (**Extent + probability + reversibility + irreplaceability + duration + cumulative effect) x magnitude/intensity.** The summation of the different criteria will produce a non-weighted value. By multiplying this value with the magnitude/intensity, the resultant value acquires a weighted characteristic which can be measured and assigned a significance rating.		
Points	Impact significance rating	Description
6 to 28	Negative low impact	The anticipated impact will have negligible negative effects and will require little to no mitigation.
6 to 28	Positive low impact	The anticipated impact will have minor positive effects.

29 to 50	Negative medium impact	The anticipated impact will have moderate negative effects and will require moderate mitigation measures.
29 to 50	Positive medium impact	The anticipated impact will have moderate positive effects.
51 to 73	Negative high impact	The anticipated impact will have significant effects and will require significant mitigation measures to achieve an acceptable level of impact.
51 to 73	Positive high impact	The anticipated impact will have significant positive effects.
74 to 96	Negative very high impact	The anticipated impact will have highly significant effects and are unlikely to be able to be mitigated adequately. These impacts could be considered "fatal flaws".
74 to 96	Positive very high impact	The anticipated impact will have highly significant positive

10.2 Summary of Impacts

The impact on Fossil Heritage is DIRECT NEGATIVE. Only the study site will be affected by the proposed development. The expected duration of the impact is assessed as potentially permanent. The impact is highly destructive but will only occur during the construction phase. The significance of the impact occurring will be **low**. As fossil heritage will be destroyed the impact is **irreversible** but the degree to which the impact can cause irreplaceable loss of resources is Low if proper mitigation is to undertaken.

11 FINDINGS AND RECOMMENDATIONS

The proposed new Township development on portion of the farm Klipfontein 716 and farm Ceres 626 in Bloemfontein, Mangaung Metropolitan Municipality, Free State is underlain by the Adelaide Subgroup, Balfour Formation of the Karoo Supergroup. According to the PalaeoMap of South African Heritage Resources Information System the Palaeontological Sensitivity of the Adelaide Subgroup is Very High (Almond *et al*, 2013; SAHRIS website; Figure 6).

A site-specific field survey of the development footprint was conducted on foot and by motor vehicle on 18 July 2020. No visible evidence of fossiliferous outcrops was found. The scarcity of fossil heritage at the proposed development footprint indicates that the impact of the proposed new Township development in Bloemfontein will be of a low significance in palaeontological terms. Thus, the construction and development may be authorised in its whole extent, as the development footprint is not considered sensitive in terms of palaeontological resources.

If fossil remains are discovered during any phase of construction, either on the surface or exposed by excavations the **Chance Find Protocol** must be implemented by the Environmental Control Officer (ECO) in charge of these developments. These discoveries ought to be protected (if possible, *in situ*) and the ECO must report to SAHRA (Contact details: SAHRA, 111 Harrington Street, Cape Town. PO Box 4637, Cape Town 8000, South Africa. Tel: 021 462 4502. Fax: +27 (0)21 462 4509. Web: www.sahra.org.za) so that correct mitigation (recording and collection) can be carry out by a paleontologist.

12 CHANCE FINDS PROTOCOL

A following procedure will only be followed if fossils are uncovered during excavation.

12.1 Legislation

Cultural Heritage in South Africa (includes all heritage resources) is protected by the **National Heritage Resources Act (Act 25 of 1999) (NHRA).** According to Section 3 of the Act, all Heritage resources include **"all objects recovered from the soil or waters of South Africa, including archaeological and palaeontological objects and material, meteorites and rare geological specimens**".

Palaeontological heritage is unique and non-renewable and is protected by the NHRA and are the property of the State. It is thus the responsibility of the State to manage and conserve fossils on behalf of the citizens of South Africa. Palaeontological resources may not be excavated, broken, moved, or destroyed by any development without prior assessment and without a permit from the relevant heritage resources authority as per section 35 of the NHRA.

12.2 Background

A fossil is the naturally preserved remains (or traces) of plants or animals embedded in rock. These plants and animals lived in the geologic past millions of years ago. Fossils are extremely rare and irreplaceable. By studying fossils, it is possible to determine the environmental conditions that existed in a specific geographical area millions of years ago.

12.3 Introduction

This informational document is intended for workmen and foremen on construction sites. It describes the actions to be taken when mining or construction activities accidentally uncovers fossil material.

It is the responsibility of the Environmental Site Officer (ESO) or site manager of the project to train the workmen and foremen in the procedure to follow when a fossil is accidentally uncovered. In the absence of the ESO, a member of the staff must be appointed to be responsible for the proper implementation of the chance find protocol as not to compromise the conservation of fossil material.

12.4 Chance Find Procedure

- If a chance find is made the person responsible for the find must immediately **stop working** and all work that could impact that finding must cease in the immediate vicinity of the find.
- The person who made the find must immediately **report** the find to his/her direct supervisor which in turn must report the find to his/her manager and the ESO or site manager. The ESO or site manager must report the find to the relevant Heritage Agency (South African Heritage Research Agency, SAHRA). (Contact details: SAHRA, 111 Harrington Street, Cape Town. PO Box 4637, Cape Town 8000, South Africa. Tel: 021 462 4502. Fax: +27 (0)21 462 4509. Web: www.sahra.org.za). The information to the Heritage Agency must include photographs of the find, from various angles, as well as the GPS co-ordinates.
- A preliminary report must be submitted to the Heritage Agency within **24 hours** of the find and must include the following: 1) date of the find; 2) a description of the discovery and a 3) description of the fossil and its context (depth and position of the fossil), GPS co-ordinates.
- Photographs (the more the better) of the discovery must be of high quality, in focus, accompanied by a scale. It is also important to have photographs of the vertical section (side) where the fossil was found.

Upon receipt of the preliminary report, the Heritage Agency will inform the ESO (or site manager) whether a rescue excavation or rescue collection by a palaeontologist is necessary.

- The site must be secured to protect it from any further damage. **No attempt** should be made to remove material from their environment. The exposed finds must be stabilized and covered by a plastic sheet or sand bags. The Heritage agency will also be able to advise on the most suitable method of protection of the find.
- In the event that the fossil cannot be stabilized the fossil may be collected with extreme care by the ESO (site manager). Fossils finds must be stored in tissue paper and in an appropriate box while due care must be taken to remove all fossil material from the rescue site.
- Once Heritage Agency has issued the written authorization, the developer may continue with the development on the affected area.

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Appendix A – Elize Butler CV

CURRICULUM VITAE

ELIZE BUTLER

PROFESSION:	Palaeontologist
YEARS' EXPERIENCE:	26 years in Palaeontology

EDUCATION:

B.Sc Botany and Zoology, 1988
University of the Orange Free State

B.Sc (Hons) Zoology, 1991
University of the Orange Free State

Management Course, 1991
University of the Orange Free State

M. Sc. *Cum laude* (Zoology), 2009
University of the Free State

Dissertation title: The postcranial skeleton of the Early Triassic non-mammalian Cynodont *Galesaurus planiceps*: implications for biology and lifestyle

MEMBERSHIP

Palaeontological Society of South Africa (PSSA)	2006-currently

EMPLOYMENT HISTORY

Part-time Laboratory assistant	Department of Zoology & Entomology University of the Free State Zoology 1989-1992
Part-time laboratory assistant	Department of Virology University of the Free State Zoology 1992
Research Assistant	National Museum, Bloemfontein 1993 – 1997
Principal Research Assistant and Collection Manager	National Museum, Bloemfontein 1998–currently

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APPENDIX D4: GEOTECHNICAL REPORT

Ngoti Development Consultants - Phase 1 Geotechnical Housing Investigation – Portion 626 Ceres and 716 Klipfontein Farms– Bloemfontein

Reference: 19-719

Dated: October 2019

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Report to Ngoti Development Consultants - Phase 1 Geotechnical Housing Investigation – Portion 626 Ceres and 716 Klipfontein Farms – Bloemfontein

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Reference 19-719	**Dated : October 2019**

EXECUTIVE SUMMARY

At the request of Mr. Fumani Mathebula of Ngoti Development Consultants, Delta Geotech (Pty) Ltd provided a proposal, on the 24th July 2019. The proposal indicated the methodology and cost to undertake a geotechnical investigation. Delta Geotech's quote was successful and a letter of appointment was received on 8th August 2019 to proceed with the investigation.

The site is located approximately 17km south of Bloemfontein. Access is gained via regional and district roads. The site currently undeveloped and, topographically, the site is flat with a slight fall towards south-west.

As the site is approximately 214Ha, according to GSFH-2 specifications, a total of sixty (60) test pits were required. These were excavated using a CAT 428F digger loader and have been designated TP1 to TP60. Test pits were advanced to depths of between 0.90m to 2.70mbegl and were profiled. Representative disturbed samples of material were taken from selected horizons for testing in a SANAS accredited commercial soils laboratory. A total of 60 DPL tests were conducted alongside each test pit. These have been numbered in conjunction with the test pit positions DPL1 – DPL60. The DPL tests extended to a depth of 2.1mbegl or earlier refusal.

The general geology of the area comprises sandstone shale and mudstone of the lower stage of the Beaufort Series, Karoo Sequence, which is intruded by Jurassic Age igneous dolerite. Colluvium and residual soils overlie rock horizons as intersected in the test pits. Perched groundwater was not intersected during the investigations. The main water table is expected to occur at depth within the fractured rock aquifer.

Twenty Foundation Indicator and five chemical tests samples, collected and sent for laboratory testing, were required to ascertain the likelihood or otherwise of active clays and potential corrosiveness at selected positions within the study area.

The site is classified as **S2/H2/R.** Foundation recommendations are tabulated in the report according to the varying soil and rock conditions. Foundation types such as cellular rafts, piers and ground beams, as well as, strip footings have been recommended.

Report to Ngoti Development Consultants - Phase 1 Geotechnical Housing Investigation – Portion 626 Ceres and 716 Klipfontein Farms – Bloemfontein

Reference : 19-719	**Dated : October 2019**

1. INTRODUCTION AND TERMS OF REFERENCE

At the request of Mr. Fumani Mathebula of Ngoti Development Consultants, Delta Geotech (Pty) Ltd provided a proposal, on the 24th July 2019. The proposal indicated the methodology and cost to undertake a geotechnical investigation. Delta Geotech's quote was successful and a letter of appointment was received on 8th August 2019 to proceed with the investigation.

2. SCOPE OF REPORT

The geotechnical report sets out the findings of the geotechnical investigation. The objectives of the investigation were as follows:

a) Undertake a desktop study using topographical and geological maps, as well as, a review of available geotechnical literature;

b) Identify any potential hazards;

c) Provide an assessment of the bearing capacity of the various founding horizons in terms of single story buildings;

d) Prediction of total heave, collapse etc. under buildings and floors;

e) Determine excavat-ability for earthworks and foundation sidewall stability;

f) Prediction of groundwater table for the protection of fills, floors and pavements;

g) Recommendations and design parameters regarding foundation solutions and approximate bearing capacities; and

h) Site class designations for EF003 form.

3. INFORMATION SUPPLIED

The following information was utilized during the investigation:

- Site development plan (SDP) provided by Ngoti Development Consultants: Proposed Township – A portion of the farm Klipfontein 716 and Farm Ceres 626, Bloemfontein.

- Remote Colour Imagery – Google (2018).
- The 1:250 000 geological map – 2926 – Bloemfontein (Council for Geoscience).
- Brink A.B.A (1985). Engineering Geology of South Africa - Post Gondwana Deposits. Volume 4. Building Publications. South Africa. 332pp.

4. SITE DESCRIPTION

The site is located approximately 17km south of Bloemfontein. Access is gained via regional and district roads. The site currently undeveloped (see Site Plan - Figure 3). The site co-ordinates are as follows:

29°13'23.83"S
26°15'28.13"E

Topographically the site is flat with a slight fall towards a wetland on the south-western portion

Plates 1 and 2 below provide an indication of the topography and conditions encountered on site.

Plate 1: Flat topography across the site.

Plate 2: Wetland on south-western portion.

5. NATURE OF INVESTIGATION

Fieldwork for the site investigation was carried out on the 21st August 2019.

The fieldwork comprised the following:

- Test Pit Excavations, Profiling & Sampling
- Dynamic Penetration Light (DPL) tests

5.1 Test Pitting

As the site is approximately 214Ha, according to GSFH-2 specifications, a total of sixty (60) test pits were required. These were excavated using a CAT 428F digger loader and have been designated TP1 to TP60. Test pits are positioned by the engineering geologist on site to cover a representative area. The detailed logs and photographs of all the profiles are provided in Appendix A with test pit locations indicated in Figure 3.

Test pits were advanced to depths of between 0.90m to 2.70mbegl (meters below existing ground level) and were profiled[1]. Representative disturbed samples of material were taken from selected horizons for testing in a SANAS accredited commercial soils laboratory.

5.2 DPL Tests

A total of 60 DPL tests were conducted alongside each test pit. These have been numbered in conjunction with the test pit positions DPL1 – DPL60. The DPL tests extended to a depth of 2.1mbegl or earlier refusal.

The results of the DPL tests are provided in Appendix B.

6. GEOLOGY AND GROUNDWATER CONDITIONS

6.1 General Geology of the Area

The general geology of the area comprises sandstone shale and mudstone of the lower stage of the Beaufort Series, Karoo Sequence which is intruded by Jurassic Age igneous dolerite.

Colluvium and residual soils overlie rock horizons as intersected in the test pits.

6.2 Site Geology

The site is overlain by colluvial and residual soils whilst underlain by rock.

[1] Geoterminology Workshop (2002) – Guidelines for Soil and Rock Logging - SAIEG-AEG-SAICE (Geotech Div) pp47

6.2.1 Colluvium

Colluvial soils were intersected in all test pits and comprise sandy silt, clayey sand, sandy clay, clayey sandy silt, silty clayey sand and silty fine sands. These occur from surface and extend to a depth of between 0.05m to 1.40m begl.

6.2.2 Residual

Intersected in all test pits except for TP1 and TP30. The residual soils comprise clayey silt, sandy clay, silty clay and clayey silty sands. These occur from below the colluvium and extend to depths of 0.40m to 1.90m begl.

6.2.3 Rock

Mudstone siltstone and sandstone were intersected in all test pits with igneous dolerite intersected in TP27. The rock occurs below the soils and extends to depths in excess of 2.70m begl. The rock varies from completely weathered very soft rock to un-weathered hard rock.

6.3 Groundwater

Perched groundwater was not intersected during the investigations. Groundwater generally relies mainly on recharge from direct infiltration of rainfall, as well as, from upslope recharge of the groundwater via horizontal flow. As such, this water table will be best developed during the wet and rainy seasons. Groundwater was however, noted in the wetland and small dam that occur on site.

The main water table is expected to occur at depth within the fractured rock aquifer.

7. LABORATORY TESTING

Twenty Foundation Indicator and five chemical tests samples, collected and sent for laboratory testing, were required to ascertain the likelihood or otherwise of active clays and potential corrosiveness at selected positions within the study area.

The points below provide a summary of the laboratory tests undertaken:

- Foundation Indicator testing comprising Atterberg Limits, Particle Size Distribution and Hydrometer analysis
- Chemical tests – pH and conductivity of soil paste

The laboratory results are provided in Table 1 and interpreted in Table 2. The full laboratory results are included in Appendix C.

Table 1:

Summary of Results of Particle Size Distribution Analysis, Atterberg Limit Determination Tests.

TP No.	Depth (m)	Description	Particle Size Distribution %				Atterberg Limits %			GM			
			Clay	Silt	Sand	Gravel	LL	PI	LS		Classification	pH	Conductivity (Sm^{-1})
3	0.10	Silty clayey sand: Colluvium	34	13	53	0	38	17	8.5	0.43	A-6; CL; Medium heave potential	-	-
8	0.40	Clayey sand: Residual	32	4	64	0	32	12	6.0	0.49	A-6; CL; Low heave potential	5.2	17.8
9	0.50	Silty clayey sand: Colluvium	27	19	54	0	24	8	4.0	0.52	A-4; SC; Low heave potential	-	-
12	0.20	Silty clayey sand: Colluvium	22	14	64	0	33	19	8.0	0.46	A-6; CL; Medium heave potential	5.3	26.5
16	1.90	Weathered mudstone	17	5	33	45	34	17	8.0	1.78	A-2-6; SC; Medium heave potential	6.9	14.6
21	0.10	Silty clayey sand: Colluvium	21	14	64	1	43	19	9.5	0.34	A-7-6; CL; Medium heave potential	8.3	31.5
26	0.40	Silty clayey sand: Residual	22	15	61	2	42	19	9.5	0.49	A-7-6; CL; Medium heave potential	-	-
30	0.10	Sandy clay: Colluvium	-	-	-	-	-	-	-	-	-	7.1	18.4
32	0.20	Silty clayey sand: Residual	34	14	49	3	43	19	9.5	0.40	A-7-6; CL; Medium heave potential	7.0	23.2

34	0.20	Silty clayey sand: Colluvium	23	18	59	0	47	23	11.5	0.22	A-7-6; CL; High heave potential	7.2	43.2
37	0.70	Clayey sand: Residual	33	5	42	20	48	20	10.0	1.19	A-7-6; CL; Medium heave potential	6.4	16.1
39	0.50	Clayey sand: Residual	27	8	63	2	29	14	7.0	0.52	A-6; CL; Medium heave potential	-	-
42	0.50	Silty clayey sand: Residual	21	17	61	1	34	19	9.5	0.42	A-6; CL; Medium heave potential	6.4	18.2
44	0.40	Silty clay sand: Residual	35	29	35	1	38	13	6.5	0.36	A-7-6; CL; Low heave potential	-	-
46	1.40	Weathered mudstone	23	23	50	4	42	18	9.0	0.26	A-7-6; CL; Medium heave potential	-	-
48	0.20	Silty clayey sand: Colluvium	33	14	53	0	30	15	7.5	0.33	A-6; CL; Low heave potential	8.3	20.2
50	1.20	Weathered mudstone	20	6	73	1	27	10	5.0	0.52	A-4; CL; Low heave potential	-	-
52	0.20	Clayey sand: Colluvium	29	7	61	3	30	14	7.0	0.57	A-6; CL; Medium heave potential	-	-
55	0.70	Clayey sand: Residual	19	5	75	1	29	13	6.5	0.42	A-6; CL; Medium heave potential	-	-
56	1.70	Weathered mudstone	24	14	62	0	39	12	6.0	0.28	A-6; CL; Medium heave potential	-	-
57	0.50	Silty clayey sand: Residual	23	18	58	1	38	17	8.5	0.42	A-6; CL; Medium heave potential	-	-

LL	-	Liquid Limit	GM	-	Grading Modulus	Classification in Terms of:	
PI	-	Plasticity Index	OMC	-	Optimum Moisture Content		Unified Soil Classification System[2]
LS	-	Linear Shrinkage					Van der Merwe[3]

[2] ASTM D 2487-06 Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System). June 2006

[3] D.H. Van Der Merwe (1964) The Prediction of Heave from the Plasticity Index and Percentage Clay Fraction of Soils. The Civil Engineer, pp 103-107

To aid in the clarity of interpreting the laboratory results the interpretation of the materials has been summarized in Table 2.

Table 2: Materials Classification and Usage for Construction

Material Type	Classification Details	Laboratory result evaluation
Colluvium	Silt & Clay = 22 to 47% Sand = 53 to 61% Gravel = 0 to 3% PI = 8 to 23 LL = 24 to 47 GM = 0.22 to 0.57 LS = 4.0 to 11.5 pH = 5.3 to 8.3 Conductivity = 18.4 to 43.2 A-6, A-7-6; CL to SC; Low to high heave potential.	Moderate fines content, with moderate to high PI, LL and LS, confirm potential expansiveness of material. With a moderate sand component of between 53 to 61% this indicates that the fines are potentially highly expansive. pH and conductivity values indicate slightly acidic to slightly basic soil conditions. Precautions may be required. Soils should have a fair workability due to the mixed grading, and could possibly be considered for use as general fill where required.
Residual	Silt & Clay =24 to 64 % Sand = 35 to 75% Gravel = 0 to 20% PI = 12 to 20 LL = 29 to 48 GM = 0.36 to 1.19 LS = 6.0 to 10.0 pH = 5.2 to 7.0 Conductivity = 16.1 to 23.2 A-6, A-7-6; CL; Low to medium heave potential.	Generally higher fines with a minor gravel component in reworked horizons. Hence high grading moduli in certain samples. High PI, LL and LS values indicate moderate potential expansiveness. pH and conductivity values indicate slightly acidic soil conditions. Precautions may be required. Soils are likely to have poor workability and should not be considered for use during construction unless for landscaping.
Weathered mudstone	Silt & Clay = 22 to 46% Sand = 33 to 60% Gravel = 0 to 45% PI = 12 to 18 LL = 34 to 42 GM = 0.26 to 1.78 LS = 6.0 to 8.0 pH = 6.9 Conductivity = 14.6 A2-6, A-6, A7-6; CL to SC; Medium heave potential	Low gravel component and grading moduli would indicate deeply weathered and decomposed horizon whilst higher values would indicate better quality less weathered material. PI and LS values are higher than expected, and possibly due to the degree of weathering and presence of fines in some of the sample. Neutral in terms of corrosion potential of the rock. Generally, highly weathered mudstone would be classified as G7 to G9 quality and could possibly be considered for use as selected subgrade or subbase materials during construction.

8. GEOTECHNICAL EVALUATION

8.1 Engineering and Materials Characteristic's

On the basis of the desk study and the available geotechnical investigation information, the following points relating to the site geotechnical conditions and constraints, may be made:

a) Colluvial soils occur consistently throughout the site. Very loose to loose and highly compressible horizons occur from surface to 1.20m begl. Below the soils are medium dense to dense in consistency slightly compressible. The colluvium is potentially moderately to highly expansive according to laboratory test results. Pockets of more fine-grained material may also be encountered due to the nature of deposition of the colluvium. Provided the structures are designed to accommodate heave movements, and allowable bearing pressures are appropriate, the medium dense to dense colluvial soils could be considered as a competent founding horizon.

b) Residual soils are generally medium dense to dense in consistency and potentially moderately to highly expansive. Provided the structures are designed to accommodate heave movements, and allowable bearing pressures are appropriate, the medium dense colluvial soils could be considered as a competent founding horizon.

c) The weathered rock is generally soft to medium hard with a low potential compressibility. The completely weathered or less weathered rock would form a competent founding horizon for the single storey structures envisaged with no additional precautions.

d) In terms of construction materials:
   - The colluvium has not been tested for moisture-density and CBR but would likely form G9/G10 quality material and could be considered as general fill if required. Compaction and strength testing is however recommended to confirm.
   - The residual soils are generally fine grained, and would have poor workability, these soils could be used for landscaping if required.
   - Experience indicates that highly weathered mudstone and dolerite would form G7-G9 quality material, and could be considered for use as selected subgrade or subbase materials. The highly weathered sandstone would likely form G8/G9, according to COLTO specifications, and could be considered as selected subgrade quality material if required.

e) Perched groundwater was not intersected in any of the test pit excavations but would likely occur at the contact between the colluvial and residual/weathered rock after periods of intense rainfall. Minor drainage precautions will likely be required.

9. IMPACT ON THE GEOTECHNICAL CHARACTER OF THE SITE ON SUBSIDY HOUSING DEVELOPMENTS

The following geotechnical characteristics of the site are expected to have an impact on subsidy housing development and subsidy variations:

Table 3: Factors to consider in subsidy variations

Category of Subsidy Variation	Verification Criteria	Factors Affecting Amount of Subsidy Variation
Site Conditions: Difficulty of servicing of land due to slopes – Type 1	Average slope measured along a line in any direction form any of the boundaries of the erf is flatter 1:100.	Difficulties associated with the provision of waterborne sanitation and the drainage of sites/provision of pumps stations.
Difficulty of excavation – Type 3	Average slope measures across any erf in any direction is steeper than 1:10 and material to a depth of 1.50m below pre-development level is classified as Boulder Class B or Hard rock excavation.	Additional cost of trench excavation.

10. RESIDENTIAL SITE CLASS DESIGNATION AND SUBSIDY VARIATIONS

The site class designations is **S2/H2/R**. The designation summarized in Table 4:

Table 4: Residential site class designations

Site Class Designation	Character of Founding Materials	Expected Range of Total Soil Movements (mm)	Assumed Differential Movement (% of Total)	Maximum Allowable Bearing Capacity (kPa) and consistency
S2	Colluvium	>20	50	80 – Medium dense
H2	Residual	15-30	50	80 – Medium dense/Firm
R	Weathered mudstone, sandstone or dolerite	Negligible	-	150 – completely weathered 300 – Highly weathered

All erven are classified as **S2/H2/R.**

11. RECOMMENDATIONS

With reference to items discussed in the geotechnical evaluation this section provides recommendations for foundations and surface beds, as well as recommendations for excavatability and drainage.

11.1 Foundation Recommendations

The following options listed in Table 5 should be considered:

Table 5: Foundation Solutions

Site Class Designation	Foundation Solutions
S2/H2/R	Found structures on colluvial and residual soils or underling rock. **Colluvial and Residual soils:** • Found on at least medium dense/firm soil using a stiffened or cellular raft with articulation joints or lightly reinforced masonry. An approximate allowable bearing pressure of 80kPa would be achievable. **Completely weathered soft rock:** • Strip or pad footings with normal construction techniques. Approximate allowable bearing pressure of 150kPa. **At least highly weathered medium hard rock:** • Strip or pad footings with normal construction techniques. Approximate allowable bearing pressure of 300kPa. In areas where rock occurs deeper than 1.10m begl consider pad footings, piers and ground beams or excavating to moderately weathered rock and backfilling with cement stabilized geotechnically inert material.

Due to slight soil acidity and alkalinity precautions to safeguard against concrete degradation should be considered. Increasing the thickness of the concrete to provide a "buffer" or, if reinforcing degradation is of concern, then consider using glass fibre reinforcing instead of steel. Glass fibre also has the benefit of being lighter which can reduce associated haulage costs.

11.2 Pavements and Surface Beds

In areas where the structures are founded over rock the following options should be considered:

1) Soils underlying the surface beds should be excavated and spoiled. This followed by introduction of geotechnically inert material from borrow, compacted in layers, to form the surface bed subgrade.
2) Alternatively, consider suspended or "floating" floor slabs.

11.3 Excavatability

Excavation in the colluvial and residual soils, as well as completely weathered rock, classifies as "Soft" excavation in terms of the SANS 1200DM Earthworks Specification. Soils can be excavated using hand picks and spades or backhoes.

Excavation in highly weathered medium hard rock would be classified as "Intermediate" excavation and could be excavated by back-acting excavator having a fly wheel power >0.10kW for each mm of tined-bucket width or with the use of pneumatic tools before removal by a machine capable of removing soft material.

Deeper excavations for services into "Hard" rock will likely require the use of pneumatic tools and blasting in the less weathered hard rock.

11.4 Slope Stability and Erosion

Due to the granular nature of the colluvium erosion could occur. Erosion would be minor due to fairly flat site gradient where vegetating the soils at surface and adequate surface water management should help in this regard.

The natural slopes in the area are relatively stable under present conditions. Excavations in unconsolidated soils deeper than 1.5m for service trenches will require shoring or battered slopes for safety reasons.

11.5 Drainage

In general attention to drainage and the effective collection and disposal of storm water run-off is required throughout the site as part of general surface water management.

Measures to prevent water ingress into soils below and against foundations will be required. These would include, grading of slopes to promote run-off and to prevent ponding close to the buildings, effective collection and removal of stormwater, and water from downpipes, as well as regular checking of wet services for leaks.

12. CONCLUSIONS

In summary, the site is suitable for the developments envisaged provided that all structures are designed accordingly.

The ground conditions described in this report refer specifically to point sources encountered in test pits and DPL's. It is therefore possible, or probable, that conditions at variance with those discussed may be encountered. Important then is that Delta Geotech (Pty) Ltd carry out periodic inspections during construction, before *in situ* subgrade treatment is carried out. Any change from the anticipated ground conditions could then be taken into account to avoid unnecessary expense. In this regard, it is important that the construction phase of the project be treated as an augmentation of the geotechnical investigation. This additional work can be conducted on a time and cost basis.

We trust that the information provided meets with your requirements. Should you have any queries do not hesitate to contact us.

Yours faithfully,

DELTA GEOTECH (PTY) LTD

Matthew Jones
MEng (Geotechnical), Pr.Sci.Nat, MSAIEG

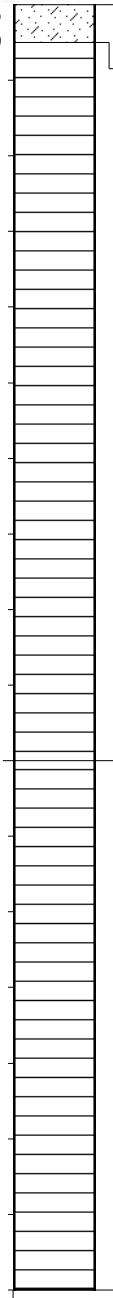
APPENDIX - A

NGOTI DEVELOPMENT CONSULTANTS
KLIPFONTEIN & CERES HOUSING DEVELOPMENT

HOLE No: **TP1**
Sheet 1 of 1

JOB NUMBER: 000

Scale 1:10



0.00 Dry grey brown dense shattered CLAYEY SAND: Colluvium.

0.05 Light grey completely weathered soft rock SILTSTONE.

1.00 Light grey moderately weathered widely jointed hard roc SILTSTONE.

1.70

NOTES

1) End of hole at 1.70m.
2) TLB refused @ 1.70m.
3) No water table
4) No Sample.

CONTRACTOR :
MACHINE :
DRILLED BY :
PROFILED BY : MJ
TYPE SET BY : RDC
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM :
DATE :
DATE : 21 August 2019
DATE : 02/10/2019 09:32
TEXT : ..emKlipfonteinAug2019.doc

ELEVATION :
X-COORD : 29ł12’55.50"S
Y-COORD : 26ł15’46.38"E

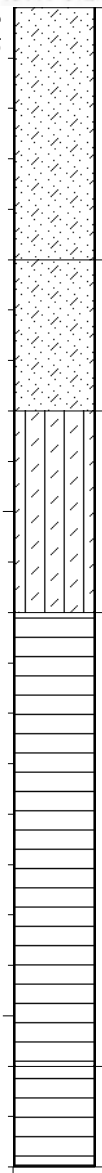
HOLE No: **TP1**

NGOTI DEVELOPMENT CONSULTANTS
KLIPFONTEIN & CERES HOUSING DEVELOPMENT

HOLE No: **TP2**
Sheet 1 of 1

JOB NUMBER: 000

Scale 1:15



0.00	Dry grey brown dense intact CLAYEY SAND: Colluvium.
0.50	Slightly moist red brown dense intact CLAYEY SAND: Colluvium.
0.80	Moist light grey firm intact: CLAYEY SILT: Residual.
1.20	Grey completely weathered soft rock MUDSTONE.
2.10	Grey highly weathered closely jointed medium hard rock MUDSTONE.
2.30	

NOTES

1) End of hole at 2.30m.
2) TLB near refusal @ 2.30m.
3) No water table.
4) No sample.

CONTRACTOR :
MACHINE :
DRILLED BY :
PROFILED BY : MJ
TYPE SET BY : RDC
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM :
DATE :
DATE : 21 August 2019
DATE : 02/10/2019 09:32
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ELEVATION :
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Y-COORD : 26ł15’39.16"E

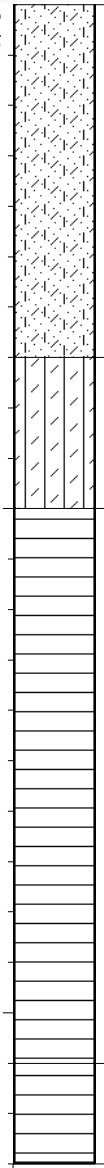
HOLE No: **TP2**

NGOTI DEVELOPMENT CONSULTANTS
KLIPFONTEIN & CERES HOUSING DEVELOPMENT

HOLE No: **TP3**
Sheet 1 of 1

JOB NUMBER: 000

Scale
B3 1:15



0.00 Dry becoming moist red brown dense becoming loose intact SILTY CLAYEY SAND: Colluvium.

0.70 Moist grey stiff intact CLAYEY SILT: Residual.

1.00 Grey completely weathered soft rock MUDSTONE.

2.10 Grey highly weathered closely jointed medium hard rock MUDSTONE.

2.30

NOTES

1) End of hole at 2.30m.
2) TLB refusal @ 2.30m.
3) No groundwater.
4) Sample B3 @ 0.10m.

CONTRACTOR :
MACHINE :
DRILLED BY :
PROFILED BY : MJ
TYPE SET BY : RDC
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM :
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DATE : 21 August 2019
DATE : 02/10/2019 09:32
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Y-COORD : 26ł15’30.50"E

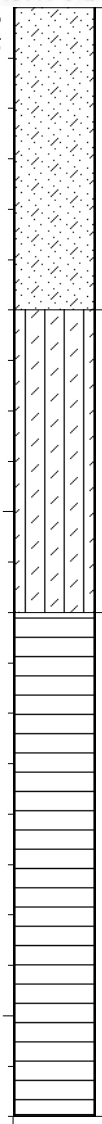
HOLE No: **TP3**

NGOTI DEVELOPMENT CONSULTANTS
KLIPFONTEIN & CERES HOUSING DEVELOPMENT

HOLE No: **TP4**
Sheet 1 of 1

JOB NUMBER: 000

Scale 1:15



0.00

Dry becoming slightly moist grey brown dense to medium dense intact CLAYEY SAND: Colluvium.

0.60

Moist grey stiff intact CLAYEY SILT: Residual.

1.20

Grey completely weathered soft rock MUDSTONE.

2.20

NOTES

1) End of hole at 2.20m.
2) TLB stopped @ 2.20m.
3) No water table.
4) No sample.

CONTRACTOR :
MACHINE :
DRILLED BY :
PROFILED BY : MJ
TYPE SET BY : RDC
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM :
DATE :
DATE : 21 August 2019
DATE : 02/10/2019 09:32
TEXT : ..emKlipfonteinAug2019.doc

ELEVATION :
X-COORD :
Y-COORD :

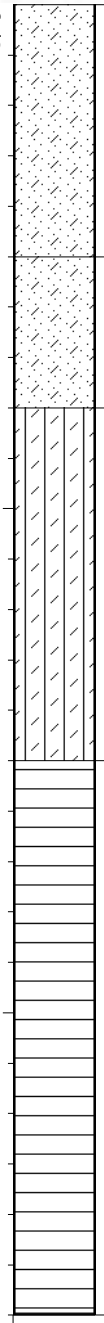
HOLE No: **TP4**

NGOTI DEVELOPMENT CONSULTANTS
KLIPFONTEIN & CERES HOUSING DEVELOPMENT

HOLE No: **TP5**
Sheet 1 of 1

JOB NUMBER: 000

Scale 1:15



0.00	Dry light grey dense intact CLAYEY SAND: Colluvium.
0.50	Slightly moist red brown loose intact CLAYEY SAND: Colluvium.
0.80	Dry grey speckled orange brown firm intact CLAYEY SILT: Residual.
1.50	Light grey completely weathered soft rock MUDSTONE.
2.60	

NOTES

1) End of hole at 2.60m.
2) TLB stopped @ 2.60m.
3) No groundwater.
4) No Sample.

CONTRACTOR :
MACHINE :
DRILLED BY :
PROFILED BY : MJ
TYPE SET BY : RDC
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM :
DATE :
DATE : 21 August 2019
DATE : 02/10/2019 09:32
TEXT : ..emKlipfonteinAug2019.doc

ELEVATION :
X-COORD : 29ł13’8.14"S
Y-COORD : 26ł15’25.47"E

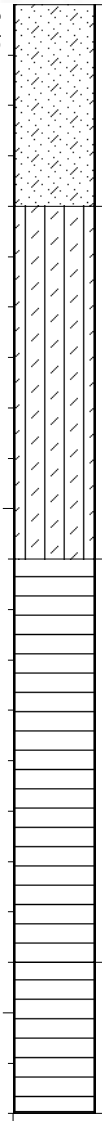
HOLE No: **TP5**

NGOTI DEVELOPMENT CONSULTANTS
KLIPFONTEIN & CERES HOUSING DEVELOPMENT

HOLE No: **TP6**
Sheet 1 of 1

JOB NUMBER: 000

Scale 1:15



0.00 Dry heavy moist red brown medium dense intact CLAYEY SAND: Colluvium.

0.40 Moist red brown soft intact CLAYEY SILT: Residual.

1.10 Grey completely weathered soft rock MUDSTONE.

1.90 Grey highly weathered closely jointed soft rock MUDSTONE.

2.20

NOTES

1) End of hole at 2.20m.
2) TLB stopped @ 2.20m.
3) No groundwater.
4) No Sample

CONTRACTOR :
MACHINE :
DRILLED BY :
PROFILED BY : MJ
TYPE SET BY : RDC
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM :
DATE :
DATE : 21 August 2019
DATE : 02/10/2019 09:32
TEXT : ..emKlipfonteinAug2019.doc

ELEVATION :
X-COORD : 29ł13’15.88"S
Y-COORD : 26ł15’12.20"E

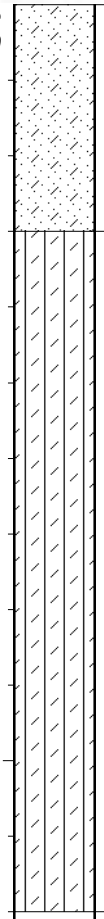
HOLE No: **TP6**

NGOTI DEVELOPMENT CONSULTANTS
KLIPFONTEIN & CERES HOUSING DEVELOPMENT

HOLE No: **TP7**
Sheet 1 of 1

JOB NUMBER: 000

Scale 1:10



0.00 Dry becoming moist red brown medium dense intact CLAYEY SAND: Colluvium.

0.30 Moist grey firm intact CLAYEY SILT: Residual

1.20 Grey completely weathered very soft rock MUDSTONE.

1.90 Grey highly weathered medium jointed medium hard rock MUDSTONE.

2.10

NOTES

1) End of hole at 2.10m.
2) TLB stopped @ 2.10m.
3) No perched groundwater
4) No sample.

CONTRACTOR :
MACHINE :
DRILLED BY :
PROFILED BY : MJ
TYPE SET BY : RDC
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM :
DATE :
DATE : 21 August 2019
DATE : 02/10/2019 09:32
TEXT : ..emKlipfonteinAug2019.doc

ELEVATION :
X-COORD :
Y-COORD :

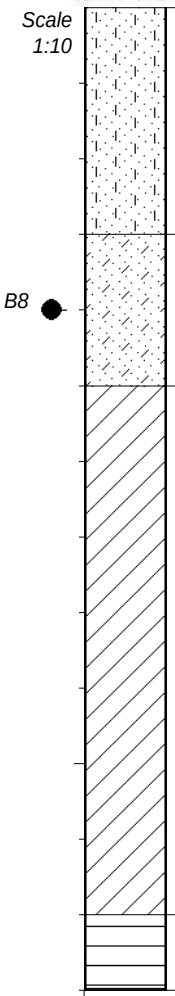
HOLE No: **TP7**

NGOTI DEVELOPMENT CONSULTANTS
KLIPFONTEIN & CERES HOUSING DEVELOPMENT

HOLE No: **TP8**
Sheet 1 of 1

JOB NUMBER: 000

Scale 1:10



0.00 Dry red brown dense intact SILTY FINE SAND: Colluvium.

0.30 Moist red brown speckled olive firm intact CLAYEY SAND: Reworked residual.

0.50 Moist brown grey specked olive soft intact CLAY: Residual.

1.20 Light grey completely weathered soft rock SILTSTONE.

1.30

NOTES

1) End of hole at 1.30m.
2) TLB stopped @ 1.30m.
3) No groundwater
4) Sample B8 @ 0.4m.

CONTRACTOR :
MACHINE :
DRILLED BY :
PROFILED BY : MJ
TYPE SET BY : RDC
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM :
DATE :
DATE : 21 August 2019
DATE : 02/10/2019 09:32
TEXT : ..emKlipfonteinAug2019.doc

ELEVATION :
X-COORD : 29 13 26
Y-COORD : 26 14 55

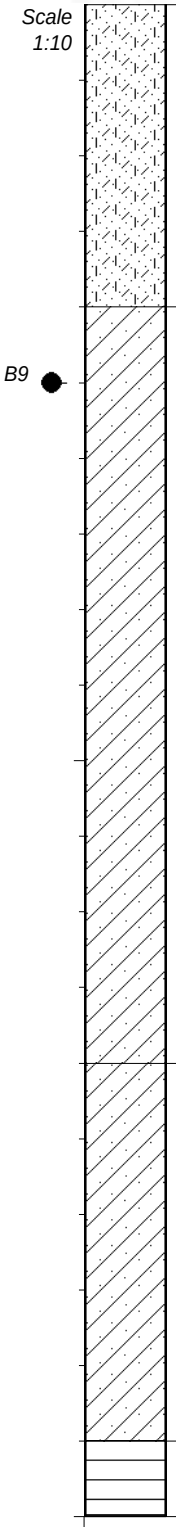
HOLE No: **TP8**

NGOTI DEVELOPMENT CONSULTANTS
KLIPFONTEIN & CERES HOUSING DEVELOPMENT

HOLE No: **TP9**
Sheet 1 of 1

JOB NUMBER: 000

Scale 1:10



0.00 Dry light grey brown dense intact SILTY CLAYEY SAND: Colluvium.

0.40 Moist light grey brown soft intact SANDY CLAY: Colluvium.

1.40 Moist light olive speckled orange stiff intact SANDY CLAY: Residual.

1.90 Grey olive highly weathered very closely jointed medium hard MUDSTONE.

2.00

NOTES

1) End of hole at 2.00m.
2) TLB stopped at 2.00m.
3) No perched groundwater
4) Sample B9 @ 0.5m.

CONTRACTOR :
MACHINE :
DRILLED BY :
PROFILED BY : MJ
TYPE SET BY : RDC
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM :
DATE :
DATE : 21 August 2019
DATE : 02/10/2019 09:32
TEXT : ..emKlipfonteinAug2019.doc

ELEVATION :
X-COORD : 29 13 29
Y-COORD : 26 14 53

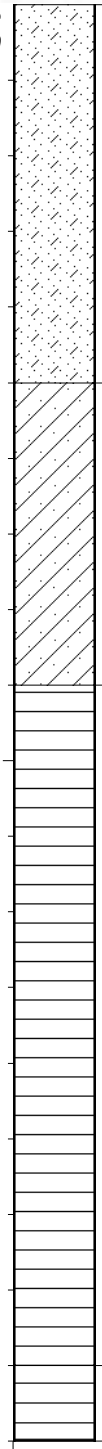
HOLE No: **TP9**

NGOTI DEVELOPMENT CONSULTANTS
KLIPFONTEIN & CERES HOUSING DEVELOPMENT

HOLE No: **TP10**
Sheet 1 of 1

JOB NUMBER: 000

Scale 1:10



0.00 Dry becoming moist red brown loose intact CLAYEY SAND: Colluvium.

0.50 Moist light grey speckled orange firm intact SANDY CLAY: Residual.

0.90 Olive completely weathered soft rock MUDSTONE.

1.80 Olive highly very closely jointed weathered medium hard MUDSTONE.

1.90

NOTES

1) End of hole at 1.90m.
2) TLB stopped @ 1.90m.
3) No perched groundwater.
4) No sample.

CONTRACTOR :
MACHINE :
DRILLED BY :
PROFILED BY : MJ
TYPE SET BY : RDC
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM :
DATE :
DATE : 21 August 2019
DATE : 02/10/2019 09:32
TEXT : ..emKlipfonteinAug2019.doc

ELEVATION :
X-COORD : 29ł13’20.54"S
Y-COORD : 26ł15’5.01"E

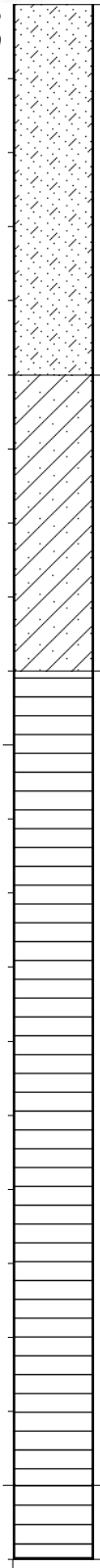
HOLE No: **TP10**

NGOTI DEVELOPMENT CONSULTANTS
KLIPFONTEIN & CERES HOUSING DEVELOPMENT

HOLE No: **TP11**
Sheet 1 of 1

JOB NUMBER: 000

Scale 1:10



0.00 Dry becoming moist red brown dense becoming loose intact CLAYEY SAND: Colluvium.

0.50 Moist olive streaked red brown soft intact SANDY CLAY: Residual.

0.90 Light olive completely weathered soft rock MUDSTONE.

2.00 Light olive highly weathered very closely jointed medium hard rock MUDSTONE.

2.10

NOTES

1) End of hole at 2.10m.
2) TLB stopped @ 2.10m.
3) No perched groundwater.
4) No sample.

CONTRACTOR :
MACHINE :
DRILLED BY :
PROFILED BY : MJ
TYPE SET BY : RDC
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM :
DATE :
DATE : 21 August 2019
DATE : 02/10/2019 09:32
TEXT : ..emKlipfonteinAug2019.doc

ELEVATION :
X-COORD : 29 13 37.4
Y-COORD : 26 14 52.6

HOLE No: **TP11**

NGOTI DEVELOPMENT CONSULTANTS
KLIPFONTEIN & CERES HOUSING DEVELOPMENT

HOLE No: **TP12**
Sheet 1 of 1

JOB NUMBER: 000

Scale 1:10

B12

0.00 Dry grey brown dense shattered SILTY CLAYEY SAND: Colluvium.

0.30 Dry light olive very stiff intact SILTY CLAY: Residual.

0.80 Light olive completely weathered soft rock MUDSTONE.

2.00 Light olive highly weathered closely jointed medium hard rock MUDSTONE.

2.10

NOTES

1) End of hole at 2.10m.
2) TLB near refusal @ 2.10m.
3) No groundwater.
4) No water table.
5) Sample B12 @ 0.10m.

CONTRACTOR :
MACHINE :
DRILLED BY :
PROFILED BY : MJ
TYPE SET BY : RDC
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM :
DATE :
DATE : 21 August 2019
DATE : 02/10/2019 09:32
TEXT : ..emKlipfonteinAug2019.doc

ELEVATION :
X-COORD : 29 13 32.8
Y-COORD : 26 15 01.8

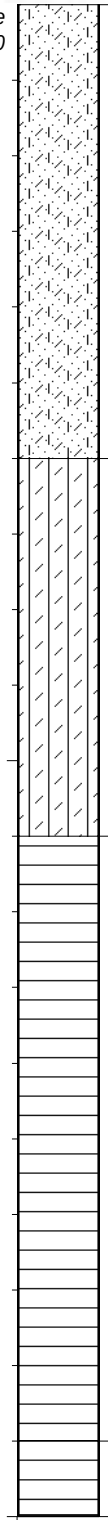
HOLE No: **TP12**

NGOTI DEVELOPMENT CONSULTANTS
KLIPFONTEIN & CERES HOUSING DEVELOPMENT

HOLE No: **TP13**
Sheet 1 of 1

JOB NUMBER: 000

Scale 1:10



0.00 Dry red brown very dense intact SILTY CLAYEY SAND: Colluvium.

0.60 Moist light olive intact CLAYEY SILT: Residual.

1.10 Light olive completely weathered soft rock MUDSTONE.

1.90 Light olive highly weathered closely jointed medium hard rock MUDSTONE.

2.00

NOTES

1) End of hole at 2.00m.
2) TLB near refusal @ 2.00m.
3) No groundwater.
4) No sample.

CONTRACTOR :
MACHINE :
DRILLED BY :
PROFILED BY : MJ
TYPE SET BY : RDC
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM :
DATE :
DATE : 21 August 2019
DATE : 02/10/2019 09:32
TEXT : ..emKlipfonteinAug2019.doc

ELEVATION :
X-COORD : 29 13 30.00
Y-COORD : 23 15 07.90

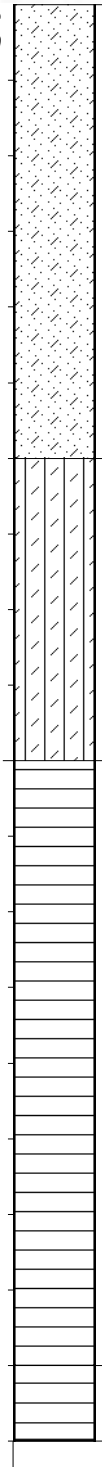
HOLE No: **TP13**

NGOTI DEVELOPMENT CONSULTANTS
KLIPFONTEIN & CERES HOUSING DEVELOPMENT

HOLE No: **TP14**
Sheet 1 of 1

JOB NUMBER: 000

Scale 1:10



0.00 Dry becoming moist red brown dense becoming loose intact CLAYEY SAND: Colluvium.

0.60 Moist light olive frim intact CLAYEY SILT: Residual.

1.00 Light olive completely weathered soft rock MUDSTONE.

1.80 Light olive highly weathered closely jointed medium hard rock MUDSTONE.

1.90

NOTES

1) End of hole at 1.90m.
2) TLB stopped @ 1.90m.
3) No groundwater.

CONTRACTOR :
MACHINE :
DRILLED BY :
PROFILED BY : MJ
TYPE SET BY : RDC
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM :
DATE :
DATE : 21 August 2019
DATE : 02/10/2019 09:32
TEXT : ..emKlipfonteinAug2019.doc

ELEVATION :
X-COORD : 29 13 25.6
Y-COORD : 26 15 16.6

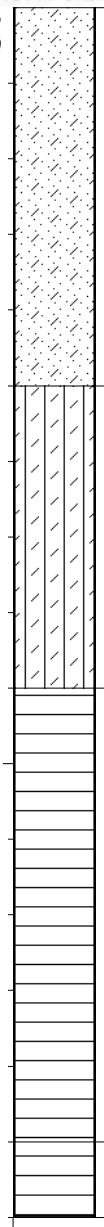
HOLE No: **TP14**

NGOTI DEVELOPMENT CONSULTANTS
KLIPFONTEIN & CERES HOUSING DEVELOPMENT

HOLE No: **TP15**
Sheet 1 of 1

JOB NUMBER: 000

Scale 1:10



0.00 Dry becoming moist red brown dense to loose intact CLAYEY SAND: Colluvium.

0.50 Moist light olive firm intact CLAYEY SILT: Residual.

0.90 Light olive completely weathered soft rock MUDSTONE.

1.50 Dark olive highly weathered closely jointed medium hard rock MUDSTONE.

1.60

NOTES

1) End of hole at 2.00m.
2) TLB stopped @ 1.60m
3) No groundwater.
4) No sample.

CONTRACTOR :
MACHINE :
DRILLED BY :
PROFILED BY : MJ
TYPE SET BY : RDC
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM :
DATE :
DATE : 21 August 2019
DATE : 02/10/2019 09:32
TEXT : ..emKlipfonteinAug2019.doc

ELEVATION :
X-COORD : 29 13 22.8
Y-COORD : 26 15 14.3

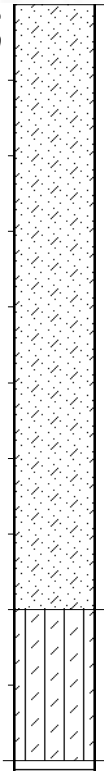
HOLE No: **TP15**

NGOTI DEVELOPMENT CONSULTANTS
KLIPFONTEIN & CERES HOUSING DEVELOPMENT

HOLE No: **TP16**
Sheet 1 of 1

JOB NUMBER: 000

Scale 1:10



0.00 Dry becoming moist red brown dense to loose intact CLAYEY SAND: Colluvium.

0.80 Moist light olive firm intact CLAYEY SILT: Residual.

1.00 Light olive completely weathered soft rock MUDSTONE.

1.90 Light olive highly weathered closely jointed medium hard rock MUDSTONE.

2.00

B16

NOTES

1) End of hole at 2.00m.
2) TLB stopped @ 2.00m.
3) No groundwater.
4) Sample B16 @ 1.90m.

CONTRACTOR :
MACHINE :
DRILLED BY :
PROFILED BY : MJ
TYPE SET BY : RDC
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM :
DATE :
DATE : 21 August 2019
DATE : 02/10/2019 09:32
TEXT : ..emKlipfonteinAug2019.doc

ELEVATION :
X-COORD : 29 13 18.8
Y-COORD : 26 15 24.8

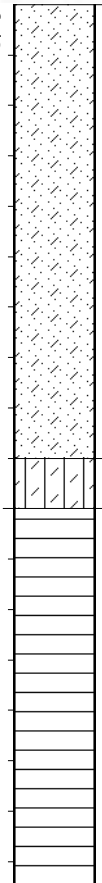
HOLE No: **TP16**

NGOTI DEVELOPMENT CONSULTANTS
KLIPFONTEIN & CERES HOUSING DEVELOPMENT

HOLE No: **TP17**
Sheet 1 of 1

JOB NUMBER: 000

Scale 1:15



0.00 Dry becoming moist red brown dense to loose intact CLAYEY SAND: Colluvium.

0.90 Moist light olive firm intact CLAYEY SILT: Residual.

1.00 Light olive completely weathered soft rock MUDSTONE.

2.20 Light olive highly weathered closely jointed medium hard rock MUDSTONE.

2.30

NOTES

1) End of hole at 2.30m.
2) TLB stopped @ 2.30m.
3) No perched groundwater.
4) No sample.

CONTRACTOR :
MACHINE :
DRILLED BY :
PROFILED BY : MJ
TYPE SET BY : RDC
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM :
DATE :
DATE : 21 August 2019
DATE : 02/10/2019 09:32
TEXT : ..emKlipfonteinAug2019.doc

ELEVATION :
X-COORD : 29 13 15.5
Y-COORD : 26 15 31.5

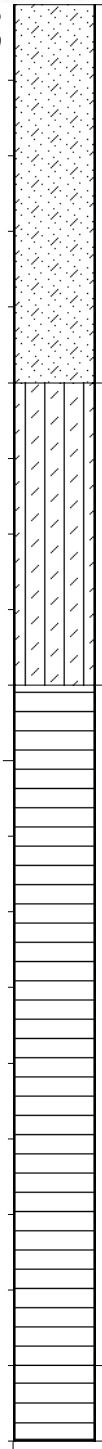
HOLE No: **TP17**

NGOTI DEVELOPMENT CONSULTANTS
KLIPFONTEIN & CERES HOUSING DEVELOPMENT

HOLE No: **TP18**
Sheet 1 of 1

JOB NUMBER: 000

Scale 1:10



0.00 Dry becoming moist red brown dense to loose intact CLAYEY SAND: Colluvium.

0.50 Moist light olive firm intact CLAYEY SILT: Residual.

0.90 Light olive completely weathered soft rock MUDSTONE.

1.80 Light olive highly weathered closely jointed medium hard rock MUDSTONE.

1.90

NOTES

1) End of hole at 1.90m.
2) TLB refusal @ 1.90m.
3) No perched groundwater.
4) No sample.

CONTRACTOR :
MACHINE :
DRILLED BY :
PROFILED BY : MJ
TYPE SET BY : RDC
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM :
DATE :
DATE : 21 August 2019
DATE : 02/10/2019 09:32
TEXT : ..emKlipfonteinAug2019.doc

ELEVATION :
X-COORD : 29 13 11.9
Y-COORD : 26 15 37.4

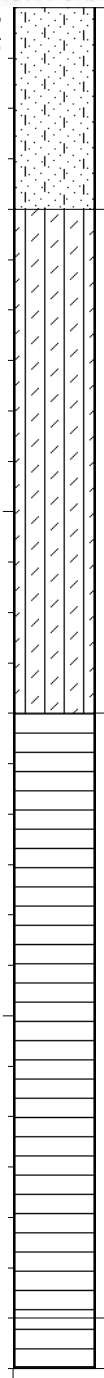
HOLE No: **TP18**

NGOTI DEVELOPMENT CONSULTANTS
KLIPFONTEIN & CERES HOUSING DEVELOPMENT

HOLE No: **TP19**
Sheet 1 of 1

JOB NUMBER: 000

Scale 1:15



0.00 Dry grey brown dense intact SILTY FINE SAND: Colluvium.

0.40 Moist grey speckled orange brown firm intact CLAYEY SILT: Residual.

1.40 Light olive completely weathered soft rock MUDSTONE.

2.60 Light olive highly weathered closely jointed medium hard rock MUDSTONE.

2.70

NOTES

1) End of hole at 2.70m.
2) TLB near refusal @ 2.70
3) No perched groundwater.

CONTRACTOR :
MACHINE :
DRILLED BY :
PROFILED BY : MJ
TYPE SET BY : RDC
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM :
DATE :
DATE : 21 August 2019
DATE : 02/10/2019 09:32
TEXT : ..emKlipfonteinAug2019.doc

ELEVATION :
X-COORD : 29 13 08.4
Y-COORD : 26 15 44.3

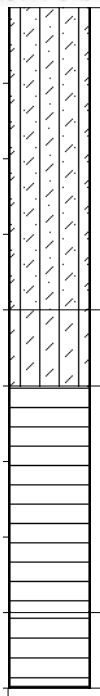
HOLE No: **TP19**

NGOTI DEVELOPMENT CONSULTANTS
KLIPFONTEIN & CERES HOUSING DEVELOPMENT

HOLE No: **TP20**
Sheet 1 of 1

JOB NUMBER: 000

Scale 1:10



0.00 Dry grey brown dense intact CLAYEY SANDY SILT: Colluvium.

0.40 Moist light olive firm intact CLAYEY SILT: Residual.

0.50 Light olive completely weathered soft rock MUDSTONE.

0.80 Light olive highly weathered closely jointed medium hard rock MUDSTONE.

0.90

NOTES

1) End of hole at 0.90m.
2) TLB refused @ 0.90m.
3) No perched groundwater.
4) No sample.

CONTRACTOR :
MACHINE :
DRILLED BY :
PROFILED BY : MJ
TYPE SET BY : RDC
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM :
DATE :
DATE : 21 August 2019
DATE : 02/10/2019 09:32
TEXT : ..emKlipfonteinAug2019.doc

ELEVATION :
X-COORD : 29 13 01.0
Y-COORD :

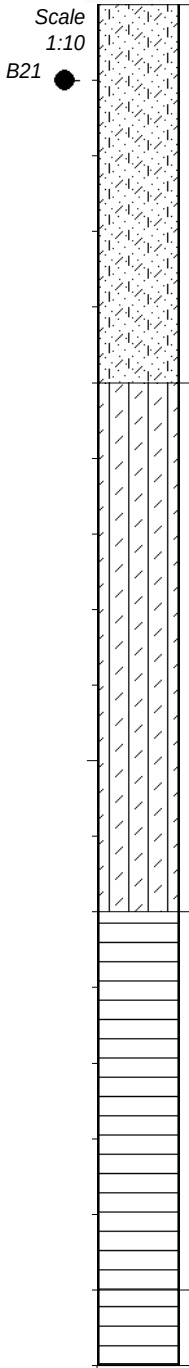
HOLE No: **TP20**

NGOTI DEVELOPMENT CONSULTANTS
KLIPFONTEIN & CERES HOUSING DEVELOPMENT

HOLE No: **TP21**
Sheet 1 of 1

JOB NUMBER: 000

Scale 1:10



0.00 Dry becoming moist red brown dense to loose intact SILTY CLAYEY SAND: Colluvium.

0.50 Moist light olive firm intact CLAYEY SILT: Residual.

1.20 Light olive completely weathered soft rock MUDSTONE.

1.70 Light olive highly weathered closely jointed medium hard rock MUDSTONE.

1.80

NOTES

1) End of hole at 1.80m.
2) TLB stopped @ 1.80m.
3) No perched groundwater.
4) Sample B21 @ 0.10m.

CONTRACTOR :
MACHINE :
DRILLED BY :
PROFILED BY : MJ
TYPE SET BY : RDC
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM :
DATE :
DATE : 21 August 2019
DATE : 02/10/2019 09:32
TEXT : ..emKlipfonteinAug2019.doc

ELEVATION :
X-COORD : 29 13 42.0
Y-COORD : 26 14 59.0

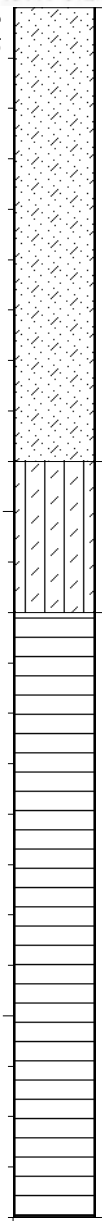
HOLE No: **TP21**

NGOTI DEVELOPMENT CONSULTANTS
KLIPFONTEIN & CERES HOUSING DEVELOPMENT

HOLE No: **TP22**
Sheet 1 of 1

JOB NUMBER: 000

Scale 1:15



0.00 Dry becoming moist red brown dense to loose intact CLAYEY SAND: Colluvium.

0.90 Moist light olive firm intact CLAYEY SILT: Residual.

1.20 Light olive completely weathered soft rock MUDSTONE.

2.40

NOTES

1) End of hole at 2.40m.
2) TLB stopped @ 2.40m.
3) No perched groundwater.

CONTRACTOR :
MACHINE :
DRILLED BY :
PROFILED BY : MJ
TYPE SET BY : RDC
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM :
DATE :
DATE : 21 August 2019
DATE : 02/10/2019 09:32
TEXT : ..emKlipfonteinAug2019.doc

ELEVATION :
X-COORD : 29ł13'38.40
Y-COORD : 26ł15'05.10

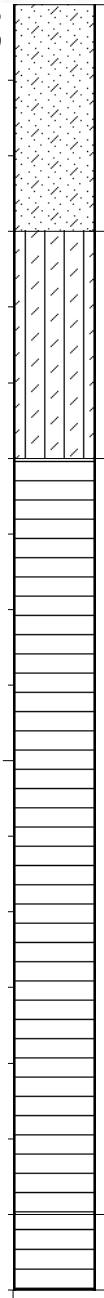
HOLE No: **TP22**

NGOTI DEVELOPMENT CONSULTANTS
KLIPFONTEIN & CERES HOUSING DEVELOPMENT

HOLE No: **TP23**
Sheet 1 of 1

JOB NUMBER: 000

Scale 1:10



0.00 Dry becoming moist red brown dense to loose intact CLAYEY SAND: Colluvium.

0.30 Moist light olive firm intact CLAYEY SILT: Residual.

0.60 Light olive completely weathered soft rock MUDSTONE.

1.60 Light olive highly weathered closely jointed medium hard rock MUDSTONE.

1.70

NOTES

1) End of hole at 1.70m.
2) TLB stopped @ 1.70m.
3) No perched groundwater.
4) No sample.

CONTRACTOR :
MACHINE :
DRILLED BY :
PROFILED BY : MJ
TYPE SET BY : RDC
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM :
DATE :
DATE : 21 August 2019
DATE : 02/10/2019 09:32
TEXT : ..emKlipfonteinAug2019.doc

ELEVATION :
X-COORD : 29 13 35.2
Y-COORD : 26 15 11.8

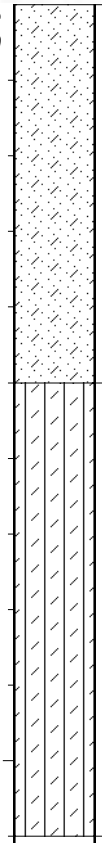
HOLE No: **TP23**

NGOTI DEVELOPMENT CONSULTANTS
KLIPFONTEIN & CERES HOUSING DEVELOPMENT

HOLE No: **TP24**
Sheet 1 of 1

JOB NUMBER: 000

Scale 1:10



0.00

Dry becoming moist red brown dense to loose intact CLAYEY SAND: Colluvium.

0.50

Moist light olive firm intact CLAYEY SILT: Residual.

1.10

Light olive completely weathered soft rock MUDSTONE.

1.70

Light olive highly weathered closely jointed medium hard rock MUDSTONE.

1.80

NOTES

1) End of hole at 1.80m.
2) TLB stopped @ 1.80m.
3) No perched groundwater.
4) No sample.

CONTRACTOR :
MACHINE :
DRILLED BY :
PROFILED BY : MJ
TYPE SET BY : RDC
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM :
DATE :
DATE : 21 August 2019
DATE : 02/10/2019 09:32
TEXT : ..emKlipfonteinAug2019.doc

ELEVATION :
X-COORD : 29 13 31.6
Y-COORD : 26 15 18.3

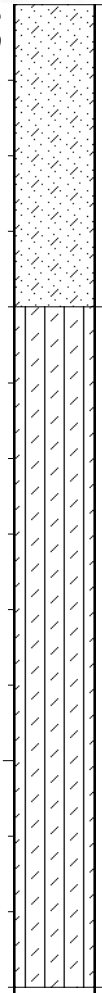
HOLE No: **TP24**

NGOTI DEVELOPMENT CONSULTANTS
KLIPFONTEIN & CERES HOUSING DEVELOPMENT

HOLE No: **TP25**
Sheet 1 of 1

JOB NUMBER: 000

Scale 1:10



0.00 Dry becoming moist red brown dense to loose intact CLAYEY SAND: Colluvium.

0.40 Moist light olive firm intact CLAYEY SILT: Residual.

1.30 Light olive completely weathered soft rock MUDSTONE.

2.00 Light olive highly weathered closely jointed medium hard rock MUDSTONE.

2.10

NOTES

1) End of hole at 2.10m.
2) TLB stopped @ 2.10m.
3) No perched groundwater.
4) No sample.

CONTRACTOR :
MACHINE :
DRILLED BY :
PROFILED BY : MJ
TYPE SET BY : RDC
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM :
DATE :
DATE : 21 August 2019
DATE : 02/10/2019 09:32
TEXT : ..emKlipfonteinAug2019.doc

ELEVATION :
X-COORD : 29ł13’27.90"S
Y-COORD : 26ł15’22.20"E

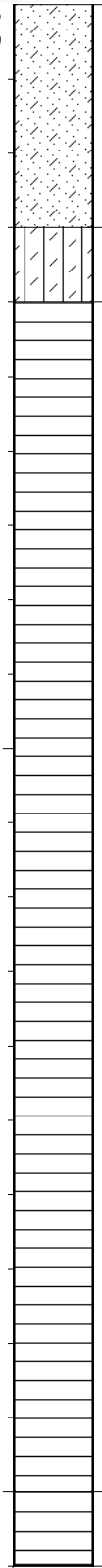
HOLE No: **TP25**

NGOTI DEVELOPMENT CONSULTANTS
KLIPFONTEIN & CERES HOUSING DEVELOPMENT

HOLE No: **TP26**
Sheet 1 of 1

JOB NUMBER: 000

Scale 1:10



0.00 Dry becoming moist red grey brown dense intact CLAYEY SAND: Colluvium.

0.30 Moist light olive soft intact SILTY CLAYEY SILT: Residual.

0.40 Light olive completely weathered soft rock MUDSTONE.

2.00 Light olive highly weathered closely jointed medium hard rock MUDSTONE.

2.10

NOTES

1) End of hole at 2.10.
2) TLB stopped @ 2.10.
3) No perched groundwater.
4) Sample B26 @ 0.40m.

CONTRACTOR :
MACHINE :
DRILLED BY :
PROFILED BY : MJ
TYPE SET BY : RDC
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM :
DATE :
DATE : 21 August 2019
DATE : 02/10/2019 09:32
TEXT : ..emKlipfonteinAug2019.doc

ELEVATION :
X-COORD : 29 13 23.8
Y-COORD : 26 15 27.7

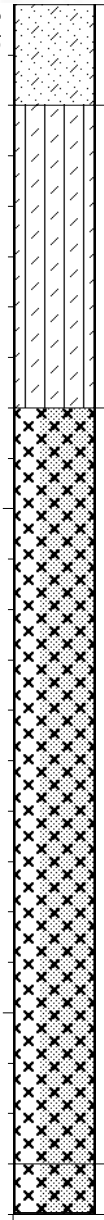
HOLE No: **TP26**

NGOTI DEVELOPMENT CONSULTANTS
KLIPFONTEIN & CERES HOUSING DEVELOPMENT

HOLE No: **TP27**
Sheet 1 of 1

JOB NUMBER: 000

Scale 1:15



0.00 Dry becoming moist red brown dense to loose intact CLAYEY SAND: Colluvium.

0.20 Moist red brown firm intact CLAYEY SILT: Residual.

0.80 Olive completely weathered soft rock DOLERITE.

2.30 Olive highly weathered closely jointed medium hard rock DOLERITE.

2.40

NOTES

1) End of hole at 2.40m.
2) TLB stopped @ 2.40m.
3) No perched groundwater.
4) No sample.

CONTRACTOR :
MACHINE :
DRILLED BY :
PROFILED BY : MJ
TYPE SET BY : RDC
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM :
DATE :
DATE : 21 August 2019
DATE : 02/10/2019 09:32
TEXT : ..emKlipfonteinAug2019.doc

ELEVATION :
X-COORD : 29 13 20.9
Y-COORD : 26 15 36.7

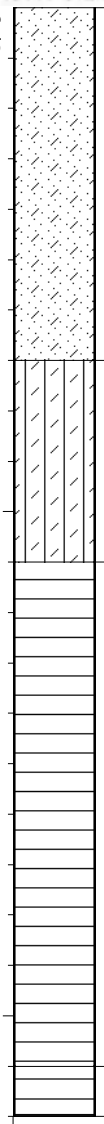
HOLE No: **TP27**

NGOTI DEVELOPMENT CONSULTANTS
KLIPFONTEIN & CERES HOUSING DEVELOPMENT

HOLE No: **TP28**
Sheet 1 of 1

JOB NUMBER: 000

Scale 1:15



0.00 Dry becoming moist light grey brown dense to loose intact CLAYEY SAND: Colluvium.

0.70 Moist light olive firm intact CLAYEY SILT: Residual.

1.10 Light olive completely weathered soft rock MUDSTONE.

2.10 Light olive highly weathered closely jointed medium hard rock MUDSTONE.

2.20

NOTES

1) End of hole at 2.20m.
2) TLB stopped @ 2.20m.
3) No perched groundwater.
4) No sample.

CONTRACTOR :
MACHINE :
DRILLED BY :
PROFILED BY : MJ
TYPE SET BY : RDC
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM :
DATE :
DATE : 21 August 2019
DATE : 02/10/2019 09:32
TEXT : ..emKlipfonteinAug2019.doc

ELEVATION :
X-COORD : 29 13 17.10
Y-COORD : 26 15 43.3

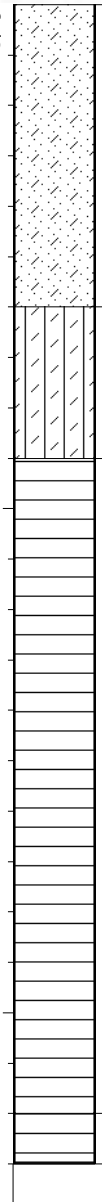
HOLE No: **TP28**

NGOTI DEVELOPMENT CONSULTANTS
KLIPFONTEIN & CERES HOUSING DEVELOPMENT

HOLE No: **TP29**
Sheet 1 of 1

JOB NUMBER: 000

Scale 1:15



0.00 Dry becoming moist red brown dense to loose intact CLAYEY SAND: Colluvium.

0.60 Moist light olive firm intact CLAYEY SILT: Residual.

0.90 Light olive completely weathered soft rock MUDSTONE.

2.20 Light olive highly weathered closely jointed medium hard rock MUDSTONE.

2.30

NOTES

1) End of hole at 2.30m.
2) TLB stopped @ 2.30m.
3) No perched groundwater.
4) No sample.

CONTRACTOR :
MACHINE :
DRILLED BY :
PROFILED BY : MJ
TYPE SET BY : RDC
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM :
DATE :
DATE : 21 August 2019
DATE : 02/10/2019 09:32
TEXT : ..emKlipfonteinAug2019.doc

ELEVATION :
X-COORD : 29 13 13.40
Y-COORD :

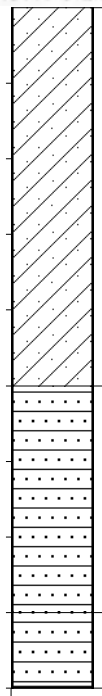
HOLE No: **TP29**

NGOTI DEVELOPMENT CONSULTANTS
KLIPFONTEIN & CERES HOUSING DEVELOPMENT

HOLE No: **TP30**
Sheet 1 of 1

JOB NUMBER: 000

Scale 1:10



0.00 Dry becoming slightly moist very stiff shattered SANDY CLAY: Colluvium.

0.50 Olive completely weathered soft rock SANDSTONE.

0.80 Olive highly weathered closely jointed medium hard rock SANDSTONE.

0.90

NOTES

1) End of hole at 0.90m.
2) TLB stopped @ 0.90m.
3) No perched groundwater.
4) Sample B30 @ 0.10m.

CONTRACTOR :
MACHINE :
DRILLED BY :
PROFILED BY : MJ
TYPE SET BY : RDC
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM :
DATE :
DATE : 21 August 2019
DATE : 02/10/2019 09:32
TEXT : ..emKlipfonteinAug2019.doc

ELEVATION :
X-COORD : 29 13 07.0
Y-COORD : 26 15 59.6

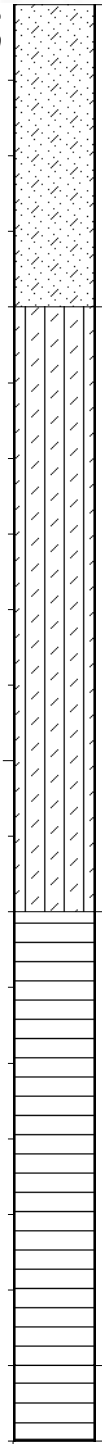
HOLE No: **TP30**

NGOTI DEVELOPMENT CONSULTANTS
KLIPFONTEIN & CERES HOUSING DEVELOPMENT

HOLE No: **TP31**
Sheet 1 of 1

JOB NUMBER: 000

Scale 1:10



0.00 Dry becoming moist red brown dense to loose intact CLAYEY SAND: Colluvium.

0.40 Moist light olive firm intact CLAYEY SILT: Residual.

1.20 Light olive completely weathered soft rock MUDSTONE.

1.80 Light olive highly weathered closely jointed medium hard rock MUDSTONE.

1.90

NOTES

1) End of hole at 1.90m.
2) TLB stopped @ 1.90m.
3) No perched groundwater.
4) No sample.

CONTRACTOR :
MACHINE :
DRILLED BY :
PROFILED BY : MJ
TYPE SET BY : RDC
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM :
DATE :
DATE : 21 August 2019
DATE : 02/10/2019 09:32
TEXT : ..emKlipfonteinAug2019.doc

ELEVATION :
X-COORD : 29 13 45.10
Y-COORD : 26 15 04.70

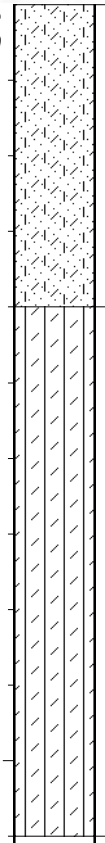
HOLE No: **TP31**

NGOTI DEVELOPMENT CONSULTANTS
KLIPFONTEIN & CERES HOUSING DEVELOPMENT

HOLE No: **TP32**
Sheet 1 of 1

JOB NUMBER: 000

Scale 1:10



0.00 Dry becoming moist red brown dense to loose intact SILTY CLAYEY SAND: Colluvium.

0.40 Moist light olive firm intact CLAYEY SILT: Residual.

1.10 Light olive completely weathered soft rock MUDSTONE.

1.70 Light olive highly weathered closely jointed medium hard rock MUDSTONE.

1.80

NOTES

1) End of hole at 1.80m.
2) TLB stopped @ 1.80m.
3) No perched groundwater.
4) Sample B32 @ 0.50m.

CONTRACTOR :
MACHINE :
DRILLED BY :
PROFILED BY : MJ
TYPE SET BY : RDC
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM :
DATE :
DATE : 21 August 2019
DATE : 02/10/2019 09:32
TEXT : ..emKlipfonteinAug2019.doc

ELEVATION :
X-COORD : 29 15 09.30
Y-COORD : 26ł15'9.28

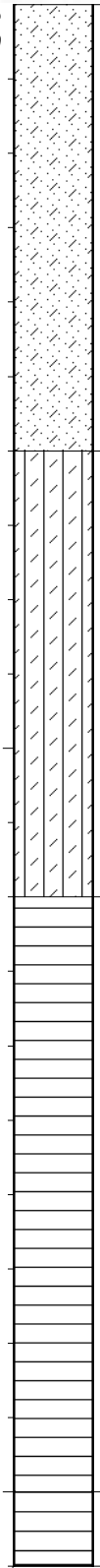
HOLE No: **TP32**

NGOTI DEVELOPMENT CONSULTANTS
KLIPFONTEIN & CERES HOUSING DEVELOPMENT

HOLE No: **TP33**
Sheet 1 of 1

JOB NUMBER: 000

Scale 1:10



0.00 Dry becoming moist red brown dense to loose intact CLAYEY SAND: Colluvium.

0.60 Moist light olive firm intact CLAYEY SILT: Residual.

1.20 Light olive completely weathered soft rock MUDSTONE.

2.00 Light olive highly weathered closely jointed medium hard rock MUDSTONE.

2.10

NOTES

1) End of hole at 2.10m.
2) TLB stopped @ 2.10m.
3) No perched groundwater.

CONTRACTOR :
MACHINE :
DRILLED BY :
PROFILED BY : MJ
TYPE SET BY : RDC
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM :
DATE :
DATE : 21 August 2019
DATE : 02/10/2019 09:32
TEXT : ..emKlipfonteinAug2019.doc

ELEVATION :
X-COORD : 29 13 39.4
Y-COORD : 26 15 15.9

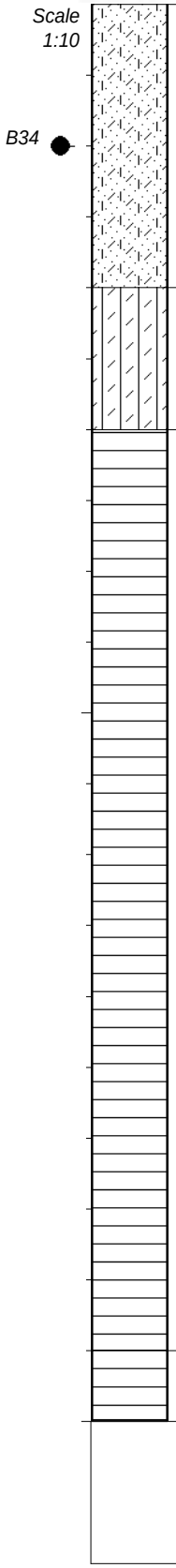
HOLE No: **TP33**

NGOTI DEVELOPMENT CONSULTANTS
KLIPFONTEIN & CERES HOUSING DEVELOPMENT

HOLE No: **TP34**
Sheet 1 of 1

JOB NUMBER: 000

Scale 1:10



0.00 Dry becoming moist red brown dense to loose intact SILTY CLAYEY SAND: Colluvium.

0.40 Moist light olive firm intact CLAYEY SILT: Residual.

0.60 Light olive completely weathered soft rock MUDSTONE.

1.90 Light olive highly weathered closely jointed medium hard rock MUDSTONE.

2.00

NOTES

1) End of hole at 2.00m.
2) TLB stopped @ 2.00m.
3) No perched groundwater.
4) Sample B34 @ 0.20m.

CONTRACTOR :
MACHINE :
DRILLED BY :
PROFILED BY : MJ
TYPE SET BY : RDC
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM :
DATE :
DATE : 21 August 2019
DATE : 02/10/2019 09:32
TEXT : ..emKlipfonteinAug2019.doc

ELEVATION :
X-COORD : 29 13 35.7
Y-COORD : 26 15 21.0

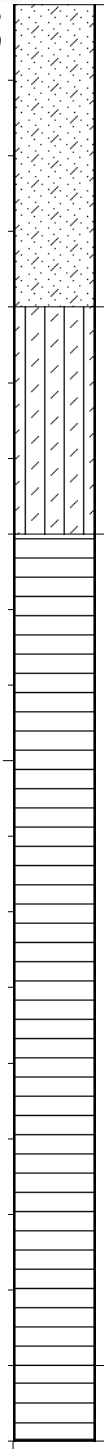
HOLE No: **TP34**

NGOTI DEVELOPMENT CONSULTANTS
KLIPFONTEIN & CERES HOUSING DEVELOPMENT

HOLE No: **TP35**
Sheet 1 of 1

JOB NUMBER: 000

Scale 1:10



0.00 Dry becoming moist red brown dense to loose intact CLAYEY SAND: Colluvium.

0.40 Moist light olive firm intact CLAYEY SILT: Residual.

0.70 Light olive completely weathered soft rock MUDSTONE.

1.80 Light olive highly weathered closely jointed medium hard rock MUDSTONE.

1.90

NOTES

1) End of hole at 1.90m.
2) TLB stopped @ 1.90m.
3) No perched groundwater.
4) Sample B35 @ 0.10m.

CONTRACTOR :
MACHINE :
DRILLED BY :
PROFILED BY : MJ
TYPE SET BY : RDC
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM :
DATE :
DATE : 21 August 2019
DATE : 02/10/2019 09:32
TEXT : ..emKlipfonteinAug2019.doc

ELEVATION :
X-COORD : 29 13 33.4
Y-COORD : 26 15 27.1

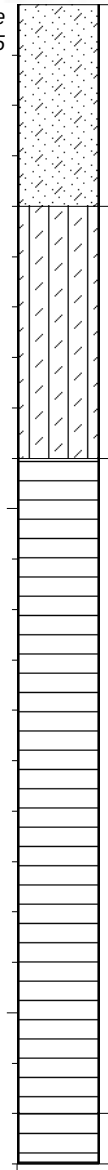
HOLE No: **TP35**

NGOTI DEVELOPMENT CONSULTANTS
KLIPFONTEIN & CERES HOUSING DEVELOPMENT

HOLE No: **TP36**
Sheet 1 of 1

JOB NUMBER: 000

Scale 1:15



0.00 Dry becoming moist red brown dense to loose intact CLAYEY SAND: Colluvium.

0.40 Moist light olive firm intact CLAYEY SILT: Residual.

0.90 Light olive completely weathered soft rock MUDSTONE.

2.20 Light olive highly weathered closely jointed medium hard rock MUDSTONE.

2.30

NOTES

1) End of hole at 2.30m.
2) TLB stopped @ 2.30m.
3) No perched groundwater.
4) No sample.

CONTRACTOR :
MACHINE :
DRILLED BY :
PROFILED BY : MJ
TYPE SET BY : RDC
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM :
DATE :
DATE : 21 August 2019
DATE : 02/10/2019 09:32
TEXT : ..emKlipfonteinAug2019.doc

ELEVATION :
X-COORD : 29 13 29.2
Y-COORD : 26 15 33.4

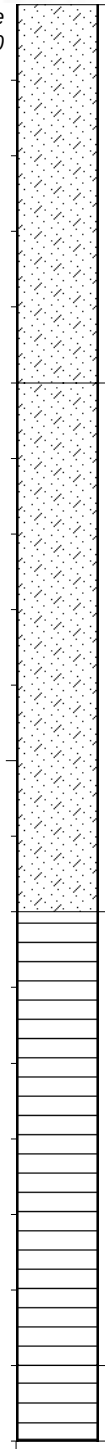
HOLE No: **TP36**

NGOTI DEVELOPMENT CONSULTANTS
KLIPFONTEIN & CERES HOUSING DEVELOPMENT

HOLE No: **TP37**
Sheet 1 of 1

JOB NUMBER: 000

Scale 1:10



0.00 Dry becoming moist red brown dense to loose intact CLAYEY SAND: Colluvium.

0.50 Moist light olive speckled white firm intact CLAYEY SAND: Residual.

1.20 Light olive completely weathered soft rock MUDSTONE.

1.80 Light olive highly weathered closely jointed medium hard rock MUDSTONE.

1.90

NOTES

1) End of hole at 1.90m.
2) TLB stopped @ 1.90m.
3) No perched groundwater.
4) B37 @ 0.70m.

CONTRACTOR :
MACHINE :
DRILLED BY :
PROFILED BY : MJ
TYPE SET BY : RDC
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM :
DATE :
DATE : 21 August 2019
DATE : 02/10/2019 09:32
TEXT : ..emKlipfonteinAug2019.doc

ELEVATION :
X-COORD : 29 13 24.7
Y-COORD : 26 15 40.6

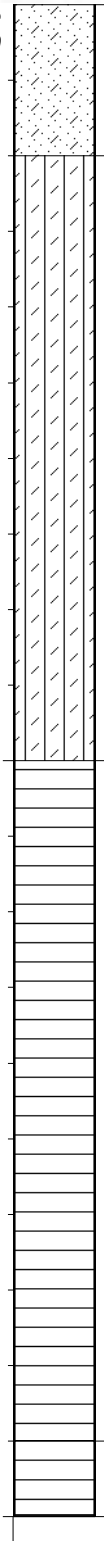
HOLE No: **TP37**

NGOTI DEVELOPMENT CONSULTANTS
KLIPFONTEIN & CERES HOUSING DEVELOPMENT

HOLE No: **TP38**
Sheet 1 of 1

JOB NUMBER: 000

Scale 1:10



0.00 Dry becoming moist grey brown dense to loose intact CLAYEY SAND: Colluvium.

0.20 Moist light olive firm intact CLAYEY SILT: Residual.

1.00 Light olive completely weathered soft rock MUDSTONE.

1.90 Light olive highly weathered closely jointed medium hard rock MUDSTONE.

2.00

NOTES

1) End of hole at 2.00m.
2) TLB stopped @ 2.00m.
3) No sample.

CONTRACTOR :
MACHINE :
DRILLED BY :
PROFILED BY : MJ
TYPE SET BY : RDC
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM :
DATE :
DATE : 21 August 2019
DATE : 02/10/2019 09:32
TEXT : ..emKlipfonteinAug2019.doc

ELEVATION :
X-COORD : 29 13 20.30
Y-COORD : 26 15 47.20

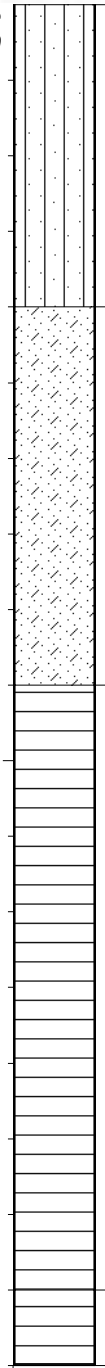
HOLE No: **TP38**

NGOTI DEVELOPMENT CONSULTANTS
KLIPFONTEIN & CERES HOUSING DEVELOPMENT

HOLE No: **TP39**
Sheet 1 of 1

JOB NUMBER: 000

Scale 1:10



0.00 Dry becoming moist light grey dense to loose intact SANDY SILT: Colluvium.

0.40 Moist light brown speckled orange brown firm intact CLAYEY SAND: Residual.

0.90 Light olive completely weathered soft rock MUDSTONE.

1.70 Light olive highly weathered closely jointed medium hard rock MUDSTONE.

1.80

NOTES

1) End of hole at 1.80m.
2) TLB stopped @ 1.80m.
3) No perched groundwater.
4) Sample B39 @ 0.50m.

CONTRACTOR :
MACHINE :
DRILLED BY :
PROFILED BY : MJ
TYPE SET BY : RDC
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM :
DATE :
DATE : 21 August 2019
DATE : 02/10/2019 09:32
TEXT : ..emKlipfonteinAug2019.doc

ELEVATION :
X-COORD : 29ł13'17.57
Y-COORD : 26ł15'55.57

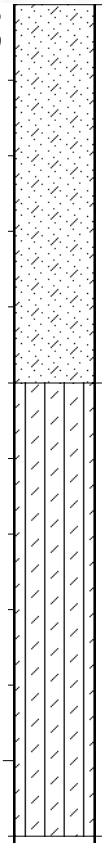
HOLE No: **TP39**

NGOTI DEVELOPMENT CONSULTANTS
KLIPFONTEIN & CERES HOUSING DEVELOPMENT

HOLE No: **TP40**
Sheet 1 of 1

JOB NUMBER: 000

Scale 1:10



0.00

Dry becoming moist grey brown dense to loose intact CLAYEY SAND: Colluvium.

0.50

Moist light olive firm intact CLAYEY SILT: Residual.

1.10

Light olive completely weathered soft rock MUDSTONE.

1.70

Light olive highly weathered closely jointed medium hard rock MUDSTONE.

1.80

NOTES

1) End of hole at 1.80m.
2) TLB stopped @ 1.80m.
3) No perched groundwater.
4) No samples.

CONTRACTOR :
MACHINE :
DRILLED BY :
PROFILED BY : MJ
TYPE SET BY : RDC
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM :
DATE :
DATE : 21 August 2019
DATE : 02/10/2019 09:32
TEXT : ..emKlipfonteinAug2019.doc

ELEVATION :
X-COORD : 29 13 12.80
Y-COORD : 26 16 05.50

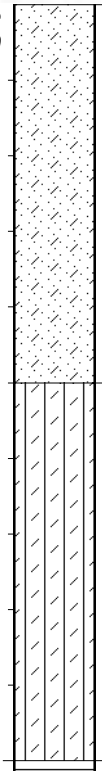
HOLE No: **TP40**

NGOTI DEVELOPMENT CONSULTANTS
KLIPFONTEIN & CERES HOUSING DEVELOPMENT

HOLE No: **TP41**
Sheet 1 of 1

JOB NUMBER: 000

Scale 1:10



0.00 Dry becoming moist red brown dense to loose intact CLAYEY SAND: Colluvium.

0.50 Moist light olive firm intact CLAYEY SILT: Residual.

1.00 Light olive completely weathered soft rock MUDSTONE.

1.80 Light olive highly weathered closely jointed medium hard rock MUDSTONE.

1.90

NOTES

1) End of hole at 1.90m.
2) TLB stopped @ 1.90m.
3) No perched groundwater.
4) No sample.

CONTRACTOR :
MACHINE :
DRILLED BY :
PROFILED BY : MJ
TYPE SET BY : RDC
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM :
DATE :
DATE : 21 August 2019
DATE : 02/10/2019 09:32
TEXT : ..emKlipfonteinAug2019.doc

ELEVATION :
X-COORD : 29 13 48.80
Y-COORD : 26 15 12.30

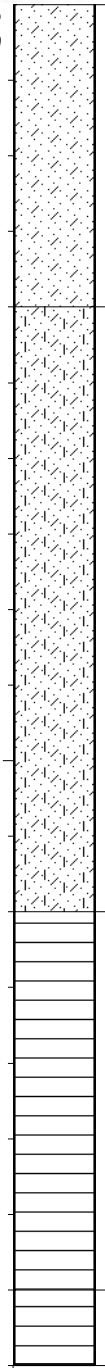
HOLE No: **TP41**

NGOTI DEVELOPMENT CONSULTANTS
KLIPFONTEIN & CERES HOUSING DEVELOPMENT

HOLE No: **TP42**
Sheet 1 of 1

JOB NUMBER: 000

Scale 1:10



0.00 Dry becoming moist red brown dense to loose intact CLAYEY SAND: Colluvium.

0.40 Moist light olive firm intact SILTY CLAYEY SAND: Residual.

1.20 Light olive completely weathered soft rock MUDSTONE.

1.70 Light olive highly weathered closely jointed medium hard rock MUDSTONE.

1.80

NOTES

1) End of hole at 1.80m.
2) TLB stopped @ 1.80m.
3) No perched groundwater.
4) Sample B42 @ 0.50m.

CONTRACTOR :
MACHINE :
DRILLED BY :
PROFILED BY : MJ
TYPE SET BY : RDC
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM :
DATE :
DATE : 21 August 2019
DATE : 02/10/2019 09:32
TEXT : ..emKlipfonteinAug2019.doc

ELEVATION :
X-COORD : 29 13 46.20
Y-COORD : 26 15 15.70

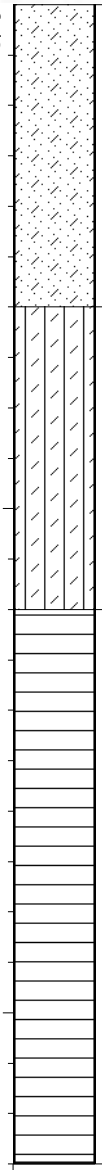
HOLE No: **TP42**

NGOTI DEVELOPMENT CONSULTANTS
KLIPFONTEIN & CERES HOUSING DEVELOPMENT

HOLE No: **TP43**
Sheet 1 of 1

JOB NUMBER: 000

Scale 1:15



0.00 Dry becoming moist red brown dense to loose intact CLAYEY SAND: Colluvium.

0.60 Moist light olive firm intact CLAYEY SILT: Residual.

1.20 Light olive completely weathered soft rock MUDSTONE.

2.30

NOTES

1) End of hole at 2.30m.
2) TLB stopped @ 2.30m.
3) No perched groundwater.
4) No sample.

CONTRACTOR :
MACHINE :
DRILLED BY :
PROFILED BY : MJ
TYPE SET BY : RDC
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM :
DATE :
DATE : 21 August 2019
DATE : 02/10/2019 09:32
TEXT : ..emKlipfonteinAug2019.doc

ELEVATION :
X-COORD : 29 13 43.70
Y-COORD : 26 15 20.20

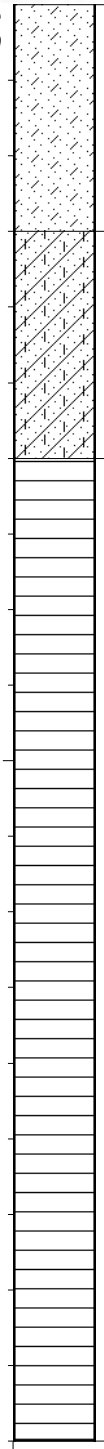
HOLE No: **TP43**

NGOTI DEVELOPMENT CONSULTANTS
KLIPFONTEIN & CERES HOUSING DEVELOPMENT

HOLE No: **TP44**
Sheet 1 of 1

JOB NUMBER: 000

Scale 1:10



0.00 Dry becoming moist red brown dense to loose intact CLAYEY SAND: Colluvium.

0.30 Moist light olive firm intact SILTY CLAY SAND: Residual.

0.60 Light olive completely weathered soft rock MUDSTONE.

1.90

NOTES

1) End of hole at 1.90m.
2) TLB stopped @ 1.90m.
3) No perched groundwater.
4) Sample B44 @ 0.40m.

CONTRACTOR :
MACHINE :
DRILLED BY :
PROFILED BY : MJ
TYPE SET BY : RDC
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM :
DATE :
DATE : 21 August 2019
DATE : 02/10/2019 09:32
TEXT : ..emKlipfonteinAug2019.doc

ELEVATION :
X-COORD : 29 13 40.2
Y-COORD : 26 15 25.2

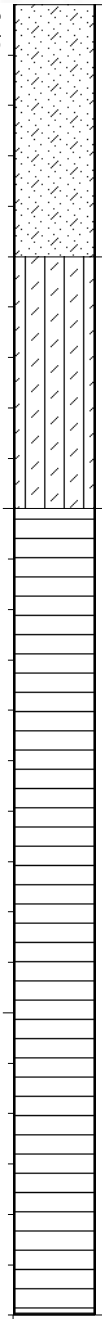
HOLE No: **TP44**

NGOTI DEVELOPMENT CONSULTANTS
KLIPFONTEIN & CERES HOUSING DEVELOPMENT

HOLE No: **TP45**
Sheet 1 of 1

JOB NUMBER: 000

Scale 1:15



0.00 Dry becoming moist red brown dense to loose intact CLAYEY SAND: Colluvium.

0.50 Moist light olive firm intact CLAYEY SILT: Residual.

1.00 Light olive completely weathered soft rock MUDSTONE.

2.60

NOTES

1) End of hole at 2.60m.
2) TLB stopped @ 2.60m.
3) No perched groundwater.
4) No sample.

CONTRACTOR :
MACHINE :
DRILLED BY :
PROFILED BY : MJ
TYPE SET BY : RDC
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM :
DATE :
DATE : 21 August 2019
DATE : 02/10/2019 09:32
TEXT : ..emKlipfonteinAug2019.doc

ELEVATION :
X-COORD : 29 13 37.0
Y-COORD : 26 15 29.8

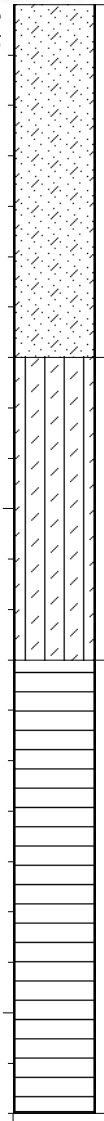
HOLE No: **TP45**

NGOTI DEVELOPMENT CONSULTANTS
KLIPFONTEIN & CERES HOUSING DEVELOPMENT

HOLE No: **TP46**
Sheet 1 of 1

JOB NUMBER: 000

Scale 1:15



0.00 Dry becoming moist red brown dense to loose intact CLAYEY SAND: Colluvium.

0.70 Moist light olive firm intact CLAYEY SILT: Residual.

1.30 Light olive completely weathered soft rock MUDSTONE.

2.20

NOTES

1) End of hole at 2.20m.
2) TLB stopped @ 2.20m.
3) No perched groundwater.
4) Sample B46 @ 1.40m.

CONTRACTOR :
MACHINE :
DRILLED BY :
PROFILED BY : MJ
TYPE SET BY : RDC
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM :
DATE :
DATE : 21 August 2019
DATE : 02/10/2019 09:32
TEXT : ..emKlipfonteinAug2019.doc

ELEVATION :
X-COORD : 29 13 33.40
Y-COORD : 26 15 35.70

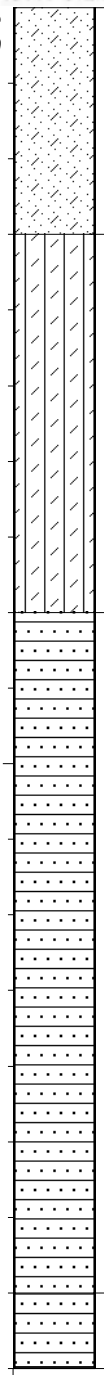
HOLE No: **TP46**

NGOTI DEVELOPMENT CONSULTANTS
KLIPFONTEIN & CERES HOUSING DEVELOPMENT

HOLE No: **TP47**
Sheet 1 of 1

JOB NUMBER: 000

Scale 1:10



0.00 Dry becoming moist red brown dense to loose intact CLAYEY SAND: Colluvium.

0.30 Moist red brown firm intact CLAYEY SILT: Residual.

0.80 Light olive completely weathered soft rock SANDSTONE.

1.70 Light olive highly weathered closely jointed medium hard rock SANDSTONE.

1.80

NOTES

1) End of hole at 1.80m.
2) TLB stopped @ 1.80m.
3) No perched groundwater.
4) No sample.

CONTRACTOR :
MACHINE :
DRILLED BY :
PROFILED BY : MJ
TYPE SET BY : RDC
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM :
DATE :
DATE : 21 August 2019
DATE : 02/10/2019 09:32
TEXT : ..emKlipfonteinAug2019.doc

ELEVATION :
X-COORD : 29 13 30.20
Y-COORD : 26 15 43.70

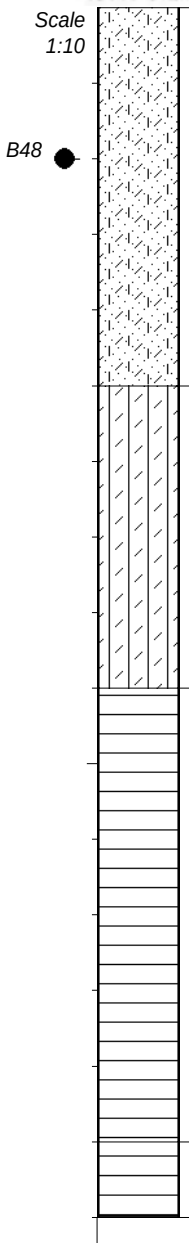
HOLE No: **TP47**

NGOTI DEVELOPMENT CONSULTANTS
KLIPFONTEIN & CERES HOUSING DEVELOPMENT

HOLE No: **TP48**
Sheet 1 of 1

JOB NUMBER: 000

Scale 1:10



0.00 Dry becoming moist red brown dense to loose intact SILTY CLAYEY SAND: Colluvium.

0.50 Moist light olive firm intact CLAYEY SILT: Residual.

0.90 Light olive completely weathered soft rock MUDSTONE.

1.50 Light olive highly weathered closely jointed medium hard rock MUDSTONE.

1.60

NOTES

1) End of hole at 1.60m.
2) TLB stopped @ 1.60m.
3) No perched groundwater.
4) Sample B48 @ 0.20m.

CONTRACTOR :
MACHINE :
DRILLED BY :
PROFILED BY : MJ
TYPE SET BY : RDC
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM :
DATE :
DATE : 21 August 2019
DATE : 02/10/2019 09:32
TEXT : ..emKlipfonteinAug2019.doc

ELEVATION :
X-COORD : 29 13 25.50
Y-COORD : 26 15 50.10

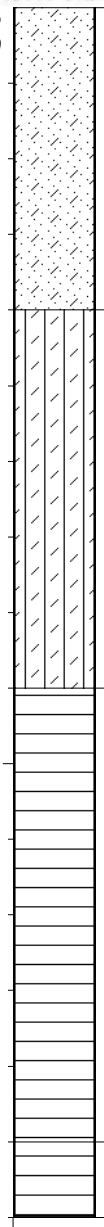
HOLE No: **TP48**

NGOTI DEVELOPMENT CONSULTANTS
KLIPFONTEIN & CERES HOUSING DEVELOPMENT

HOLE No: **TP49**
Sheet 1 of 1

JOB NUMBER: 000

Scale 1:10



0.00 Dry becoming moist red brown dense to loose intact CLAYEY SAND: Colluvium.

0.40 Moist light olive firm intact CLAYEY SILT: Residual.

0.90 Light olive completely weathered soft rock MUDSTONE.

1.50 Light olive highly weathered closely jointed medium hard rock MUDSTONE.

1.60

NOTES

1) End of hole at 1.60m.
2) TLB stopped @ 1.60m.
3) No perched groundwater.
4) No sample.

CONTRACTOR :
MACHINE :
DRILLED BY :
PROFILED BY : MJ
TYPE SET BY : RDC
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM :
DATE :
DATE : 21 August 2019
DATE : 02/10/2019 09:32
TEXT : ..emKlipfonteinAug2019.doc

ELEVATION :
X-COORD : 29 13 22.70
Y-COORD : 26 15 59.60

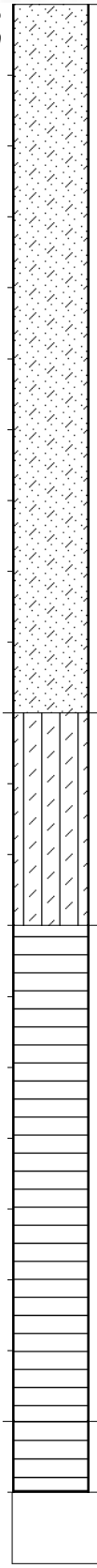
HOLE No: **TP49**

NGOTI DEVELOPMENT CONSULTANTS
KLIPFONTEIN & CERES HOUSING DEVELOPMENT

HOLE No: **TP50**
Sheet 1 of 1

JOB NUMBER: 000

Scale 1:10



0.00 Dry becoming moist red brown dense to loose intact CLAYEY SAND: Colluvium.

1.00 Moist grey speckled orange brown firm intact CLAYEY SILT: Residual.

1.30 Light olive completely weathered soft rock MUDSTONE.

2.00 Light olive highly weathered closely jointed medium hard rock MUDSTONE.

2.10

NOTES

1) End of hole at 2.10m.
2) TLB stopped @ 2.10m.
3) No perched groundwater.
4) Sample B50 @ 1.40m.

CONTRACTOR :
MACHINE :
DRILLED BY :
PROFILED BY : MJ
TYPE SET BY : RDC
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM :
DATE :
DATE : 21 August 2019
DATE : 02/10/2019 09:32
TEXT : ..emKlipfonteinAug2019.doc

ELEVATION :
X-COORD : 29 13 17.90
Y-COORD : 26 16 08.80

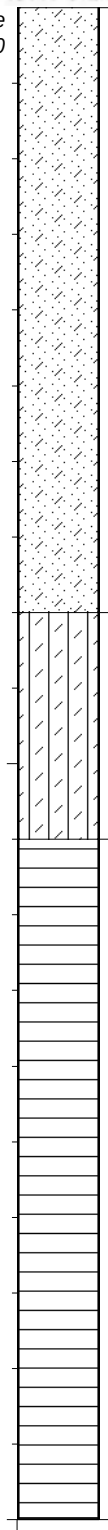
HOLE No: **TP50**

NGOTI DEVELOPMENT CONSULTANTS
KLIPFONTEIN & CERES HOUSING DEVELOPMENT

HOLE No: **TP51**
Sheet 1 of 1

JOB NUMBER: 000

Scale 1:10



0.00 Dry becoming moist red brown dense to loose intact CLAYEY SAND: Colluvium.

0.80 Moist light olive firm intact CLAYEY SILT: Residual.

1.10 Light olive completely weathered soft rock MUDSTONE.

2.00

NOTES

1) End of hole at 2.00m.
2) TLB stopped @ 2.00m.
3) No perched groundwater.
4) No sample.

CONTRACTOR :
MACHINE :
DRILLED BY :
PROFILED BY : MJ
TYPE SET BY : RDC
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM :
DATE :
DATE : 21 August 2019
DATE : 02/10/2019 09:32
TEXT : ..emKlipfonteinAug2019.doc

ELEVATION :
X-COORD : 29 13 53.00
Y-COORD : 26 15 19.50

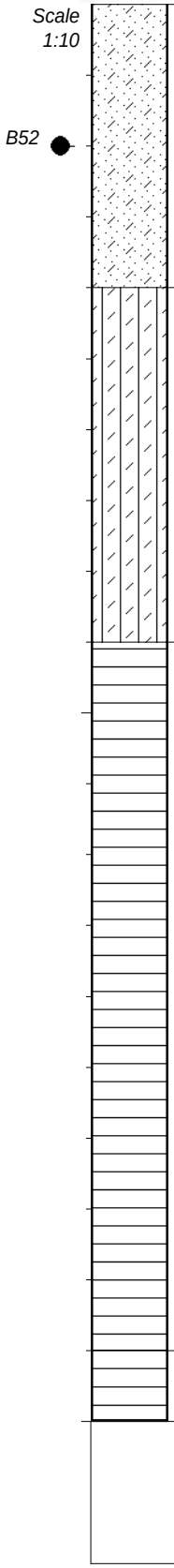
HOLE No: **TP51**

NGOTI DEVELOPMENT CONSULTANTS
KLIPFONTEIN & CERES HOUSING DEVELOPMENT

HOLE No: **TP52**
Sheet 1 of 1

JOB NUMBER: 000

Scale 1:10



0.00 Dry becoming moist red brown dense to loose intact CLAYEY SAND: Colluvium.

0.40 Moist light olive firm intact CLAYEY SILT: Residual.

0.90 Light olive completely weathered soft rock MUDSTONE.

1.90 Light olive highly weathered closely jointed medium hard rock MUDSTONE.

2.00

NOTES

1) End of hole at 2.00m.
2) TLB stopped @ 2.00m.
3) No perched groundwater.
4) Sample B52 @ 0.20m.

CONTRACTOR :
MACHINE :
DRILLED BY :
PROFILED BY : MJ
TYPE SET BY : RDC
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM :
DATE :
DATE : 21 August 2019
DATE : 02/10/2019 09:32
TEXT : ..emKlipfonteinAug2019.doc

ELEVATION :
X-COORD : 29 13 49.50
Y-COORD : 26 15 22.20

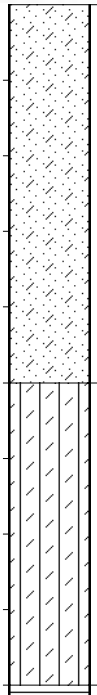
HOLE No: **TP52**

NGOTI DEVELOPMENT CONSULTANTS
KLIPFONTEIN & CERES HOUSING DEVELOPMENT

HOLE No: **TP53**
Sheet 1 of 1

JOB NUMBER: 000

Scale 1:10



0.00 Dry becoming moist red brown dense to loose intact CLAYEY SAND: Colluvium.

0.50 Moist light olive firm intact CLAYEY SILT: Residual.

0.90 Light olive completely weathered soft rock MUDSTONE.

2.00 Light olive highly weathered closely jointed medium hard rock MUDSTONE.

2.10

NOTES

1) End of hole at 2.10m.
2) TLB stopped @ 2.10m
3) No perched groundwater.
4) No sample.

CONTRACTOR :
MACHINE :
DRILLED BY :
PROFILED BY : MJ
TYPE SET BY : RDC
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM :
DATE :
DATE : 21 August 2019
DATE : 02/10/2019 09:32
TEXT : ..emKlipfonteinAug2019.doc

ELEVATION :
X-COORD : 29 13 47.10
Y-COORD : 26 15 26.30

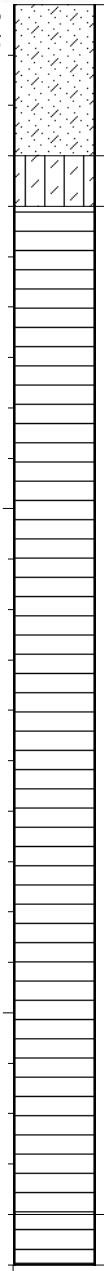
HOLE No: **TP53**

NGOTI DEVELOPMENT CONSULTANTS
KLIPFONTEIN & CERES HOUSING DEVELOPMENT

HOLE No: **TP54**
Sheet 1 of 1

JOB NUMBER: 000

Scale 1:15



0.00 Dry becoming moist red brown dense to loose intact CLAYEY SAND: Colluvium.

0.30 Moist light olive firm intact CLAYEY SILT: Residual.

0.40 Light olive completely weathered soft rock MUDSTONE.

2.40 Light olive highly weathered closely jointed medium hard rock MUDSTONE.

2.50

NOTES

1) End of hole at 2.50m.
2) TLB stopped @ 2.50m.
3) No perched groundwater.
4) No sample.

CONTRACTOR :
MACHINE :
DRILLED BY :
PROFILED BY : MJ
TYPE SET BY : RDC
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM :
DATE :
DATE : 21 August 2019
DATE : 02/10/2019 09:32
TEXT : ..emKlipfonteinAug2019.doc

ELEVATION :
X-COORD : 29ł13’44.23"S
Y-COORD : 26ł15’31.14"E

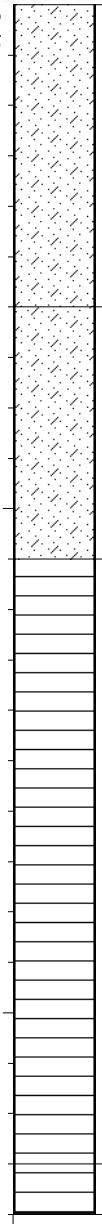
HOLE No: **TP54**

NGOTI DEVELOPMENT CONSULTANTS
KLIPFONTEIN & CERES HOUSING DEVELOPMENT

HOLE No: **TP55**
Sheet 1 of 1

JOB NUMBER: 000

Scale 1:15



0.00 Dry becoming moist red brown dense to loose intact CLAYEY SAND: Colluvium.

0.60 Moist light olive firm intact CLAYEY SAND: Residual.

1.10 Light olive completely weathered soft rock MUDSTONE.

2.30 Light olive highly weathered closely jointed medium hard rock MUDSTONE.

2.40

NOTES

1) End of hole at 2.40m.
2) TLB stopped @ 2.40m
3) No perched groundwater.
4) B55 @ 0.70m.

CONTRACTOR :
MACHINE :
DRILLED BY :
PROFILED BY : MJ
TYPE SET BY : RDC
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM :
DATE :
DATE : 21 August 2019
DATE : 02/10/2019 09:32
TEXT : ..emKlipfonteinAug2019.doc

ELEVATION :
X-COORD : 24 13 41.60
Y-COORD : 26 15 38.60

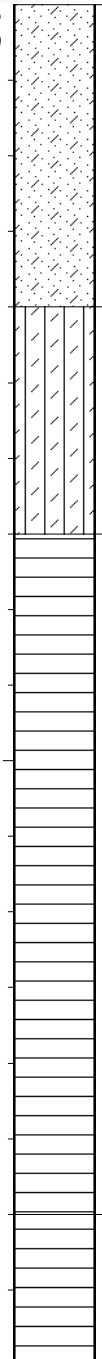
HOLE No: **TP55**

NGOTI DEVELOPMENT CONSULTANTS
KLIPFONTEIN & CERES HOUSING DEVELOPMENT

HOLE No: **TP56**
Sheet 1 of 1

JOB NUMBER: 000

Scale 1:10



0.00 Dry becoming moist red brown dense to loose intact CLAYEY SAND: Colluvium.

0.40 Moist light olive firm intact CLAYEY SILT: Residual.

0.70 Light olive completely weathered soft rock MUDSTONE.

1.60 Light olive highly weathered closely jointed medium hard rock MUDSTONE.

B56

1.80

NOTES

1) End of hole at 1.80m.
2) TLB stopped @ 1.80m.
3) No perched groundwater.
4) Sample B56 @ 1.70m.

CONTRACTOR :
MACHINE :
DRILLED BY :
PROFILED BY : MJ
TYPE SET BY : RDC
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM :
DATE :
DATE : 21 August 2019
DATE : 02/10/2019 09:32
TEXT : ..emKlipfonteinAug2019.doc

ELEVATION :
X-COORD : 29á13 37.80
Y-COORD : 26 15 44.50

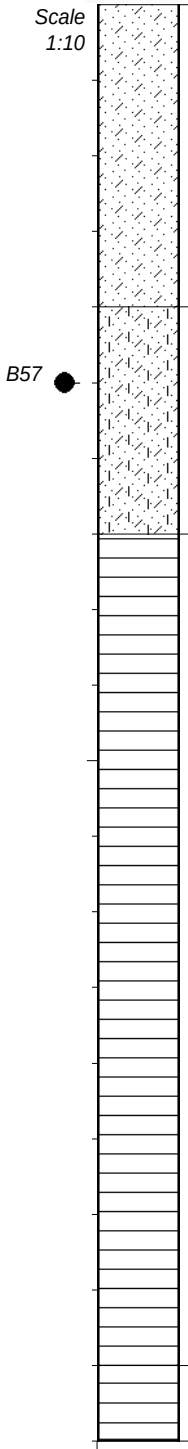
HOLE No: **TP56**

NGOTI DEVELOPMENT CONSULTANTS
KLIPFONTEIN & CERES HOUSING DEVELOPMENT

HOLE No: **TP57**
Sheet 1 of 1

JOB NUMBER: 000

Scale 1:10



0.00 Dry becoming moist red brown dense to loose intact CLAYEY SAND: Colluvium.

0.40 Moist light olive firm intact SILTY CLAYEY SAND: Residual.

0.70 Light olive completely weathered soft rock MUDSTONE.

1.80 Light olive highly weathered closely jointed medium hard rock MUDSTONE.

1.90

NOTES

1) End of hole at 1.90m.
2) TLB stopped @ 1.90m.
3) No perched groundwater.
4) Sample B57 @ 0.50m.

CONTRACTOR :
MACHINE :
DRILLED BY :
PROFILED BY : MJ
TYPE SET BY : RDC
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM :
DATE :
DATE : 21 August 2019
DATE : 02/10/2019 09:32
TEXT : ..emKlipfonteinAug2019.doc

ELEVATION :
X-COORD : 29 13 35.70
Y-COORD : 26 15 50.70

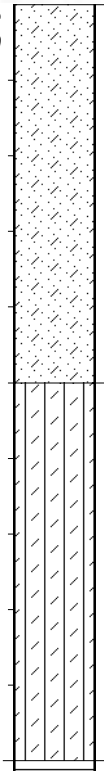
HOLE No: **TP57**

NGOTI DEVELOPMENT CONSULTANTS
KLIPFONTEIN & CERES HOUSING DEVELOPMENT

HOLE No: **TP58**
Sheet 1 of 1

JOB NUMBER: 000

Scale 1:10



0.00 Dry becoming moist red brown dense to loose intact CLAYEY SAND: Colluvium.

0.50 Moist light olive firm intact CLAYEY SILT: Residual.

1.00 Light olive completely weathered soft rock MUDSTONE.

1.80 Light olive highly weathered closely jointed medium hard rock MUDSTONE.

1.90

NOTES

1) End of hole at 1.90m.
2) TLB stopped @ 1.90m.
3) No perched groundwater.
4) No sample.

CONTRACTOR :
MACHINE :
DRILLED BY :
PROFILED BY : MJ
TYPE SET BY : RDC
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM :
DATE :
DATE : 21 August 2019
DATE : 02/10/2019 09:32
TEXT : ..emKlipfonteinAug2019.doc

ELEVATION :
X-COORD : 29 13 32.40
Y-COORD : 26 15 59.10

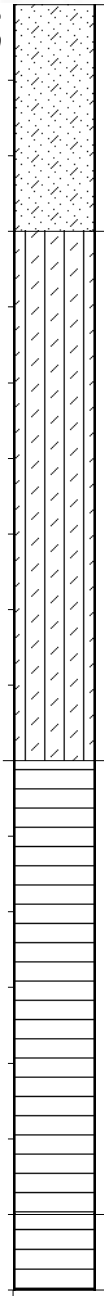
HOLE No: **TP58**

NGOTI DEVELOPMENT CONSULTANTS
KLIPFONTEIN & CERES HOUSING DEVELOPMENT

HOLE No: **TP59**
Sheet 1 of 1

JOB NUMBER: 000

Scale 1:10



0.00 Dry becoming moist red brown dense to loose intact CLAYEY SAND: Colluvium.

0.30 Moist light grey speckled olive firm intact CLAYEY SILT: Residual.

1.00 Light olive completely weathered soft rock MUDSTONE.

1.60 Light olive highly weathered closely jointed medium hard rock MUDSTONE.

1.70

NOTES

1) End of hole at 1.70m.
2) TLB stopped @ 1.70m.
3) No perched groundwater.
4) No sample.

CONTRACTOR :
MACHINE :
DRILLED BY :
PROFILED BY : MJ
TYPE SET BY : RDC
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM :
DATE :
DATE : 21 August 2019
DATE : 02/10/2019 09:32
TEXT : ..emKlipfonteinAug2019.doc

ELEVATION :
X-COORD : 29ł13’28.60"S
Y-COORD : 26ł16’5.89"E

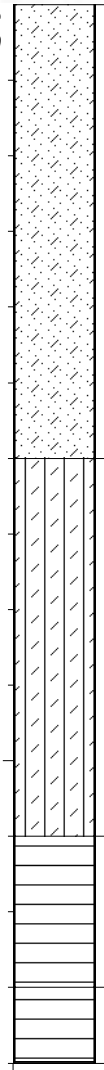
HOLE No: **TP59**

NGOTI DEVELOPMENT CONSULTANTS
KLIPFONTEIN & CERES HOUSING DEVELOPMENT

HOLE No: **TP60**
Sheet 1 of 1

JOB NUMBER: 000

Scale 1:10



0.00 Dry becoming moist red brown dense to loose intact CLAYEY SAND: Colluvium.

0.60 Moist light olive firm intact CLAYEY SILT: Residual.

1.10 Light olive completely weathered soft rock MUDSTONE.

1.30 Light olive highly weathered closely jointed medium hard rock MUDSTONE.

1.40

NOTES

1) End of hole at 1.40m.
2) TLB refusal @ 1.40m.
3) No perched groundwater.
4) No sample.

CONTRACTOR :
MACHINE :
DRILLED BY :
PROFILED BY : MJ
TYPE SET BY : RDC
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM :
DATE :
DATE : 21 August 2019
DATE : 02/10/2019 09:32
TEXT : ..emKlipfonteinAug2019.doc

ELEVATION :
X-COORD : 32 39 48.00
Y-COORD : 27 17 40.30

HOLE No: **TP60**

APPENDIX - B

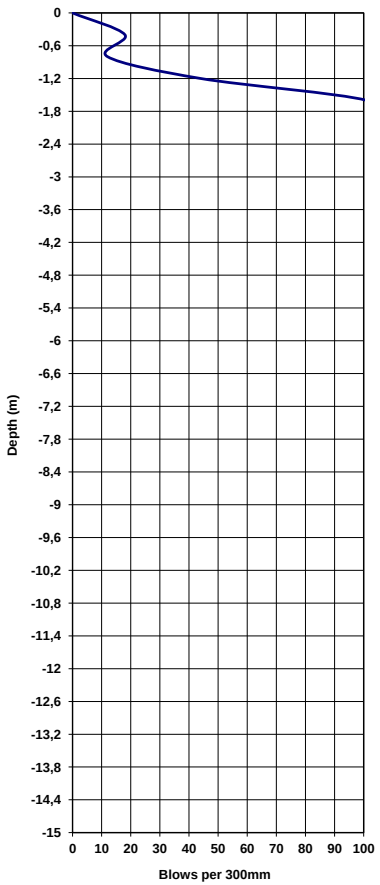
Delta Geotech (Pty) Ltd

Client:	**Ngoti Development Consultants**	**Ref.No.**	**19-719**
Project:	**Ceres and Klipfontein Development - Bloemfontein**	**Date:**	**2019/08/21**
Section:		**Operator:**	**MJ**

Light Dynamic Penetrometer Probe ---------- ***Test No. DPL 1***

Hammer: 10kg falling 550mm
Cone: 25mm diameter with 60 degree apex angle
Rods: 16mm diameter, 22mm diameter couplings
C=1
Phi=0

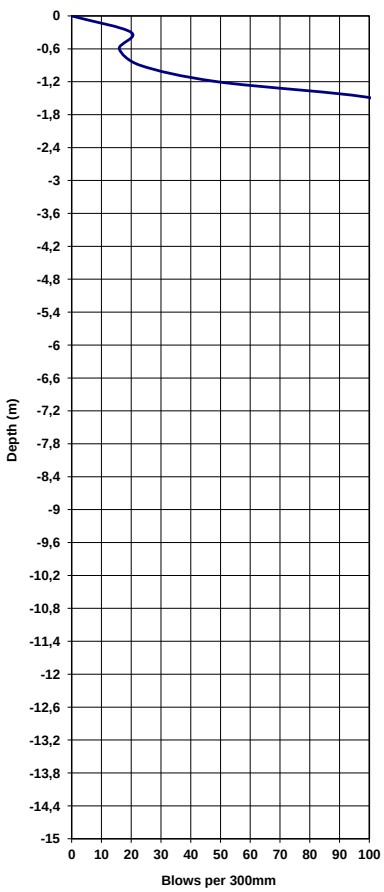
Depth metres	Blows per 300mm	Inferred Consistency
0		
0,3	18	Med.Dense
0,6	12	Loose
0,9	44	Dense
1,2	Ref	



Light Dynamic Penetrometer Probe ---------- ***Test No. DPL 2***

Hammer: 10kg falling 550mm
Cone: 25mm diameter with 60 degree apex angle
Rods: 16mm diameter, 22mm diameter couplings
C=1
Phi=0

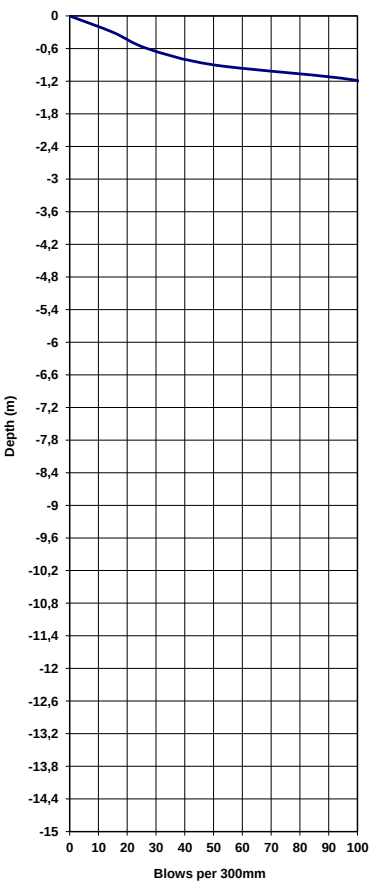
Depth metres	Blows per 300mm	Inferred Consistency
0		
0,3	20	Med.Dense
0,6	16	Med.Dense
0,9	23	Med.Dense
1,2	49	Dense
1,5	Ref	



Light Dynamic Penetrometer Probe ---------- ***Test No. DPL***

Hammer: 10kg falling 550mm
Cone: 25mm diameter with 60 degree apex angle
Rods: 16mm diameter, 22mm diameter couplings
C=1
Phi=0

Depth metres	Blows per 300mm	Inferred Consistency
0	27	
0,3	15	Loose
0,6	27	Med.Dense
1,2	50	Med.Dense
1,5	Ref	



THE INSITU STRENGTH DEPENDS ON SOIL MOISTURE CONTENT AND GRAIN STRUCTURE WHICH HAVE NOT BEEN ASSESSED AND MAY CHANGE. THE VALUES GIVEN ARE THEREFORE INDICATIVE ONLY AND SHOULD BE VERIFIED BY TEST OR OBSERVATION

Delta Geotech (Pty) Ltd

Client:	**Ngoti Development Consultants**	**Ref.No.**	**19-719**
Project:	**Ceres and Klipfontein Development - Bloemfontein**	**Date:**	**2019/08/21**
Section:		**Operator:**	**MJ**

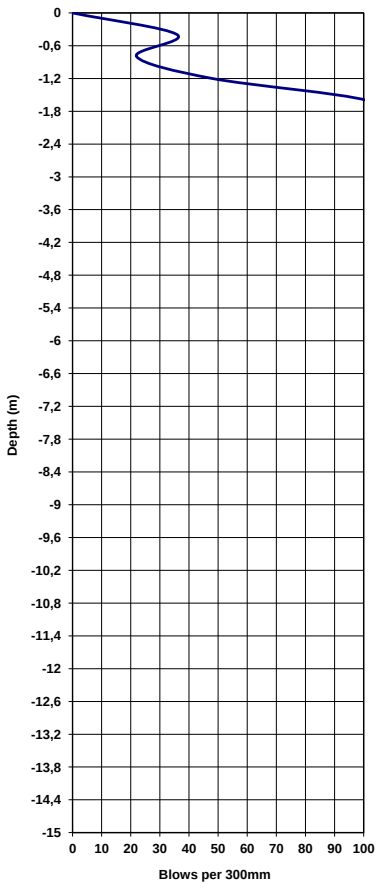
Light Dynamic Penetrometer Probe ---------- ***Test No. DPL 4***

THE INSITU STRENGTH DEPENDS ON SOIL MOISTURE CONTENT AND GRAIN STRUCTURE WHICH HAVE NOT BEEN ASSESSED AND MAY CHANGE. THE VALUES GIVEN ARE THEREFORE INDICATIVE ONLY AND SHOULD BE VERIFIED BY TEST OR OBSERVATION

Hammer: 10kg falling 550mm
Cone: 25mm diameter with 60 degree apex angle
Rods: 16mm diameter, 22mm diameter couplings

C=1
Phi=0

Depth metres	Blows per 300mm	Inferred Consistency
0		
0,3	36	Med.Dense
0,6	22	Med.Dense
0,9	48	Dense
1,2	Ref	

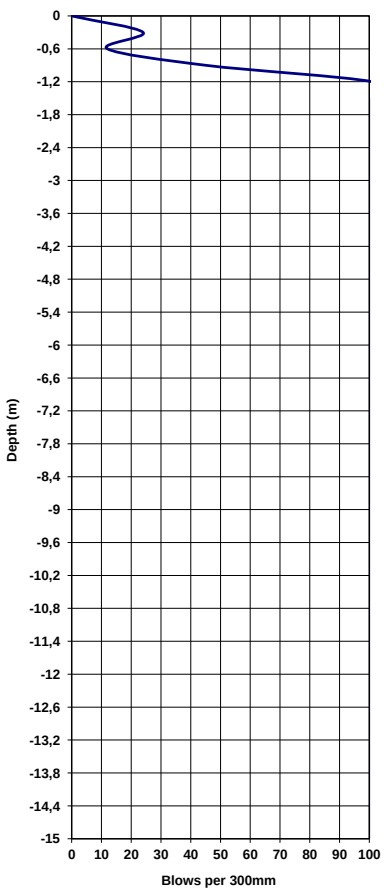


Light Dynamic Penetrometer Probe ---------- ***Test No. DPL 5***

Hammer: 10kg falling 550mm
Cone: 25mm diameter with 60 degree apex angle
Rods: 16mm diameter, 22mm diameter couplings

C=1
Phi=0

Depth metres	Blows per 300mm	Inferred Consistency
0		
0,3	24	Med.Dense
0,6	12	Loose
0,9	45	Dense
1,2	Ref	

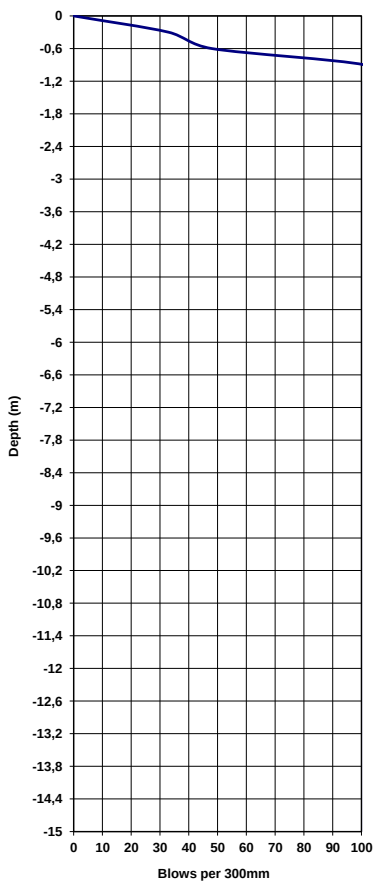


Light Dynamic Penetrometer Probe ---------- ***Test No. DPL 6***

Hammer: 10kg falling 550mm
Cone: 25mm diameter with 60 degree apex angle
Rods: 16mm diameter, 22mm diameter couplings

C=1
Phi=0

Depth metres	Blows per 300mm	Inferred Consistency
0		
0,3	33	Med.Dense
0,6	48	Dense
1,2	Ref	



Delta Geotech (Pty) Ltd

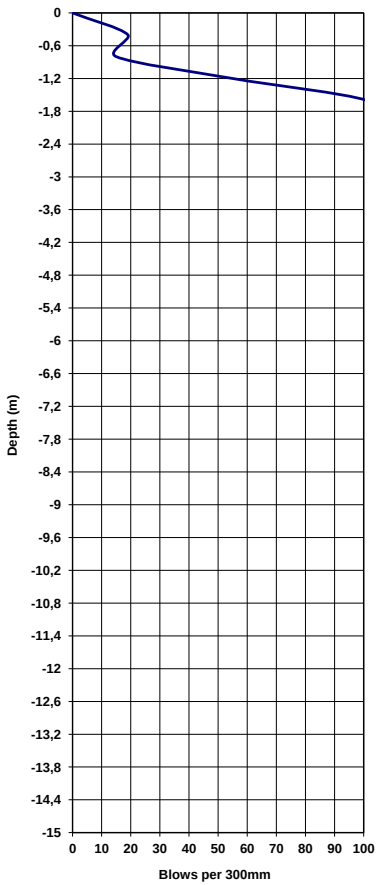
Client:	**Ngoti Development Consultants**	**Ref.No.**	**19-719**
Project:	**Ceres and Klipfontein Development - Bloemfontein**	**Date:**	**2019/08/21**
Section:		**Operator:**	**MJ**

Light Dynamic Penetrometer Probe ---------- ***Test No. DPL 7***

Hammer: 10kg falling 550mm
Cone: 25mm diameter with 60 degree apex angle
Rods: 16mm diameter, 22mm diameter couplings

C=1
Phi=0

Depth metres	Blows per 300mm	Inferred Consistency
0		
0,3	19	Med.Dense
0,6	15	Loose
0,9	55	Dense
1,2	Ref	

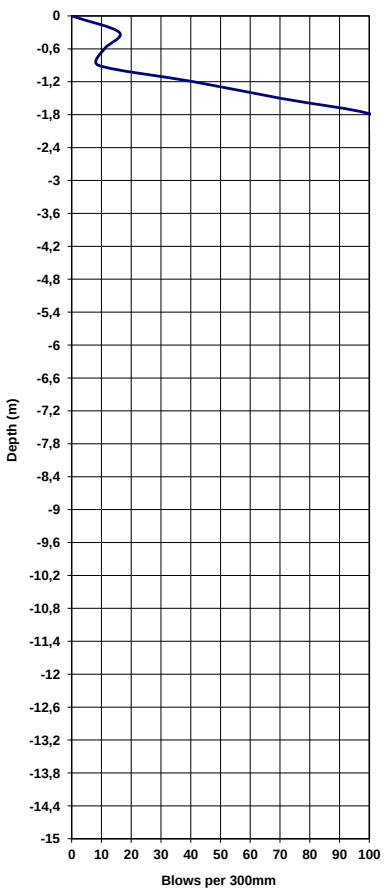


Light Dynamic Penetrometer Probe ---------- ***Test No. DPL 8***

Hammer: 10kg falling 550mm
Cone: 25mm diameter with 60 degree apex angle
Rods: 16mm diameter, 22mm diameter couplings

C=1
Phi=0

Depth metres	Blows per 300mm	Inferred Consistency
0		
0,3	16	Med.Dense
0,6	11	Loose
0,9	9	Loose
1,2	41	Dense
1,5	70	Dense
1,8	Ref	

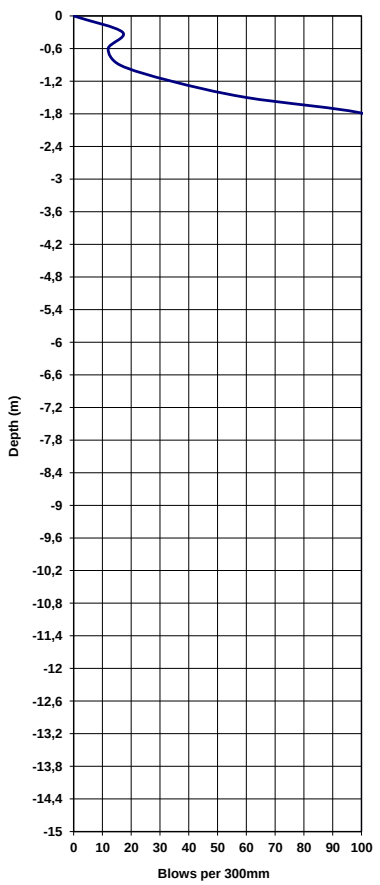


Light Dynamic Penetrometer Probe ---------- ***Test No. DPL 9***

Hammer: 10kg falling 550mm
Cone: 25mm diameter with 60 degree apex angle
Rods: 16mm diameter, 22mm diameter couplings

C=1
Phi=0

Depth metres	Blows per 300mm	Inferred Consistency
0		
0,3	17	Med.Dense
0,6	12	Loose
1,2	16	Loose
1,5	34	Med.Dense
1,8	60	Dense
2,1	Ref	



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Delta Geotech (Pty) Ltd

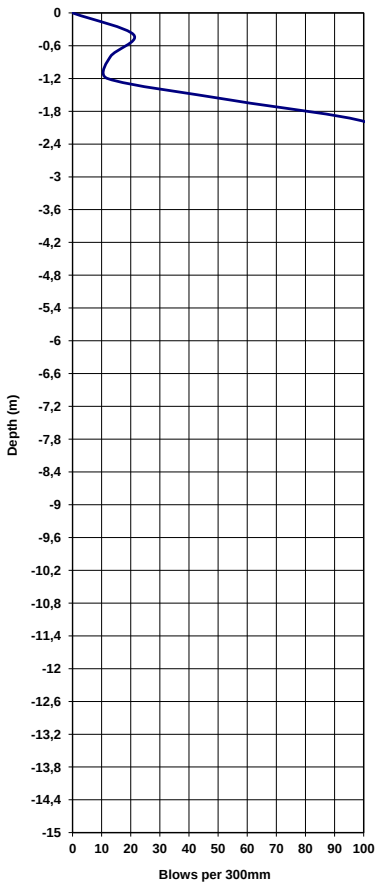
Client:	**Ngoti Development Consultants**	**Ref.No.**	**19-719**
Project:	**Ceres and Klipfontein Development - Bloemfontein**	**Date:**	**2019/08/21**
Section:		**Operator:**	**MJ**

Light Dynamic Penetrometer Probe ---------- ***Test No. DPL 10***

Hammer: 10kg falling 550mm
Cone: 25mm diameter with 60 degree apex angle
Rods: 16mm diameter, 22mm diameter couplings

C=1
Phi=0

Depth metres	Blows per 300mm	Inferred Consistency
0		
0,3	21	Med.Dense
0,6	13	Loose
0,9	12	Loose
1,2	55	Dense
	Ref	

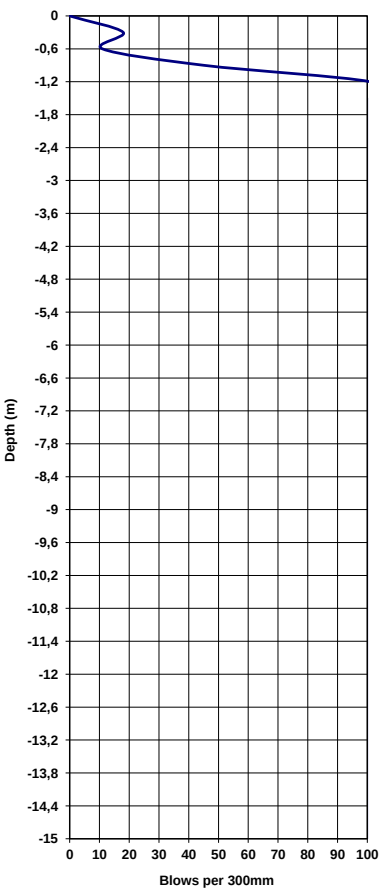


Light Dynamic Penetrometer Probe ---------- ***Test No. DPL 11***

Hammer: 10kg falling 550mm
Cone: 25mm diameter with 60 degree apex angle
Rods: 16mm diameter, 22mm diameter couplings

C=1
Phi=0

Depth metres	Blows per 300mm	Inferred Consistency
0		
0,3	18	Med.Dense
0,6	11	Loose
0,9	45	Dense
1,2	Ref	

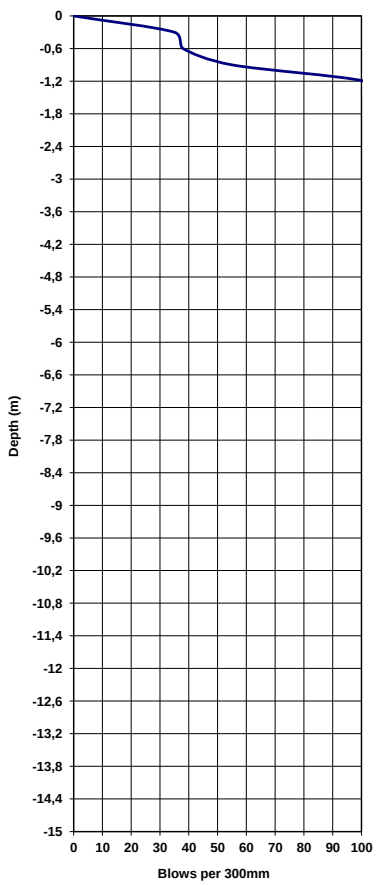


Light Dynamic Penetrometer Probe ---------- ***Test No. DPL 12***

Hammer: 10kg falling 550mm
Cone: 25mm diameter with 60 degree apex angle
Rods: 16mm diameter, 22mm diameter couplings

C=1
Phi=0

Depth metres	Blows per 300mm	Inferred Consistency
0		
0,3	35	Med.Dense
0,6	38	Med.Dense
1,2	55	Med.Dense
1,5	Ref	



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Delta Geotech (Pty) Ltd

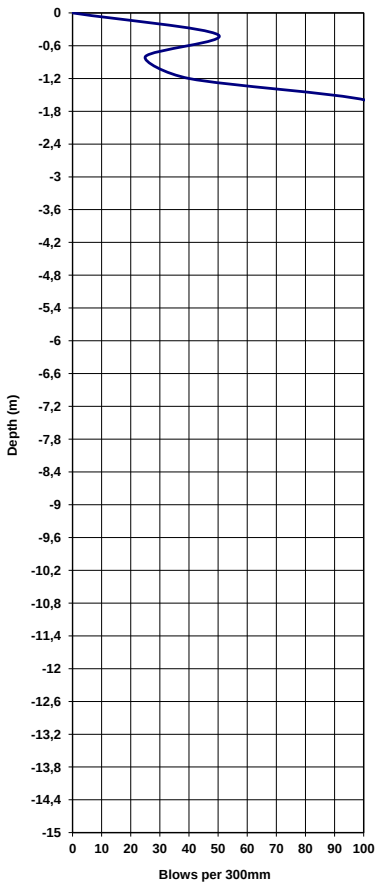
Client:	**Ngoti Development Consultants**	**Ref.No.**	**19-719**
Project:	**Ceres and Klipfontein Development - Bloemfontein**	**Date:**	**2019/08/21**
Section:		**Operator:**	**MJ**

Light Dynamic Penetrometer Probe ---------- ***Test No. DPL 13***

Hammer: 10kg falling 550mm
Cone: 25mm diameter with 60 degree apex angle
Rods: 16mm diameter, 22mm diameter couplings

C=1
Phi=0

Depth metres	Blows per 300mm	Inferred Consistency
0		
0,3	50	Dense
0,6	25	Med.Dense
0,9	40	Med.Dense
1,2	Ref	

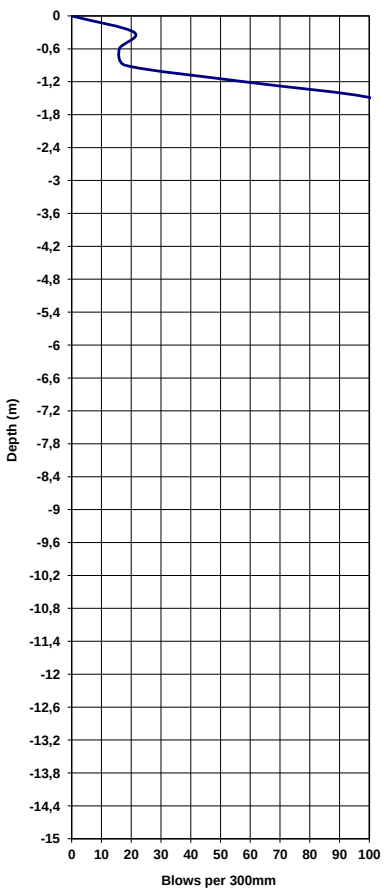


Light Dynamic Penetrometer Probe ---------- ***Test No. DPL 14***

Hammer: 10kg falling 550mm
Cone: 25mm diameter with 60 degree apex angle
Rods: 16mm diameter, 22mm diameter couplings

C=1
Phi=0

Depth metres	Blows per 300mm	Inferred Consistency
0		
0,3	21	Med.Dense
0,6	16	Med.Dense
0,9	18	Med.Dense
1,2	58	Dense
	Ref	

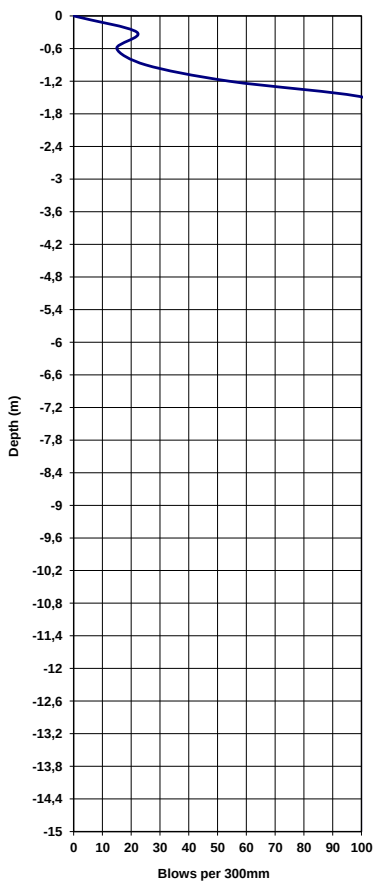


Light Dynamic Penetrometer Probe ---------- ***Test No. DPL 15***

Hammer: 10kg falling 550mm
Cone: 25mm diameter with 60 degree apex angle
Rods: 16mm diameter, 22mm diameter couplings

C=1
Phi=0

Depth metres	Blows per 300mm	Inferred Consistency
0		
0,3	22	Med.Dense
0,6	15	Loose
1,2	25	Loose
1,5	54	Dense
	Ref	



THE INSITU STRENGTH DEPENDS ON SOIL MOISTURE CONTENT AND GRAIN STRUCTURE WHICH HAVE NOT BEEN ASSESSED AND MAY CHANGE. THE VALUES GIVEN ARE THEREFORE INDICATIVE ONLY AND SHOULD BE VERIFIED BY TEST OR OBSERVATION

Delta Geotech (Pty) Ltd

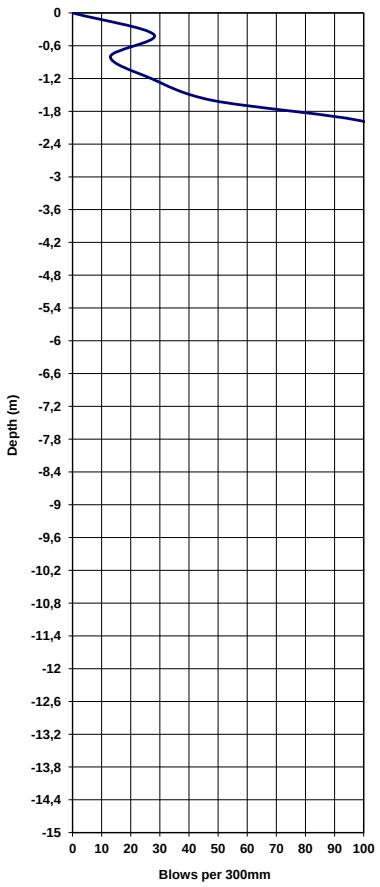
Client:	**Ngoti Development Consultants**	**Ref.No.**	**19-719**
Project:	**Ceres and Klipfontein Development - Bloemfontein**	**Date:**	**2019/08/21**
Section:		**Operator:**	**MJ**

Light Dynamic Penetrometer Probe ---------- ***Test No. DPL 16***

Hammer: 10kg falling 550mm
Cone: 25mm diameter with 60 degree apex angle
Rods: 16mm diameter, 22mm diameter couplings

C=1
Phi=0

Depth metres	Blows per 300mm	Inferred Consistency
0		
0,3	28	Med.Dense
0,6	13	Loose
0,9	27	Med.Dense
1,2	48	Dense
1,5	Ref	

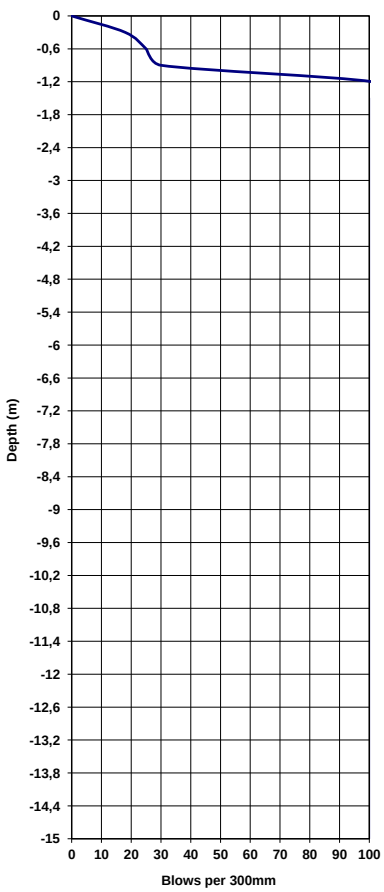


Light Dynamic Penetrometer Probe ---------- ***Test No. DPL 17***

Hammer: 10kg falling 550mm
Cone: 25mm diameter with 60 degree apex angle
Rods: 16mm diameter, 22mm diameter couplings

C=1
Phi=0

Depth metres	Blows per 300mm	Inferred Consistency
0		
0,3	18	Med.Dense
0,6	25	Med.Dense
0,9	30	Med.Dense
1,2	Ref	

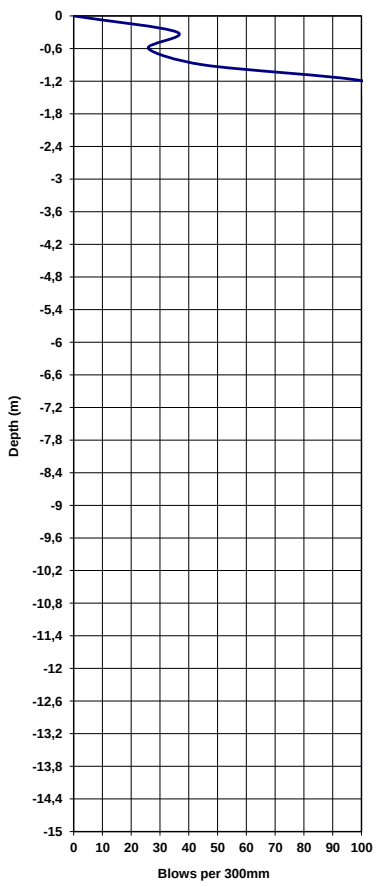


Light Dynamic Penetrometer Probe ---------- ***Test No. DPL 18***

Hammer: 10kg falling 550mm
Cone: 25mm diameter with 60 degree apex angle
Rods: 16mm diameter, 22mm diameter couplings

C=1
Phi=0

Depth metres	Blows per 300mm	Inferred Consistency
0		
0,3	36	Med.Dense
0,6	26	Med.Dense
1,2	45	Med.Dense
1,5	Ref	



THE INSITU STRENGTH DEPENDS ON SOIL MOISTURE CONTENT AND GRAIN STRUCTURE WHICH HAVE NOT BEEN ASSESSED AND MAY CHANGE. THE VALUES GIVEN ARE THEREFORE INDICATIVE ONLY AND SHOULD BE VERIFIED BY TEST OR OBSERVATION

Delta Geotech (Pty) Ltd

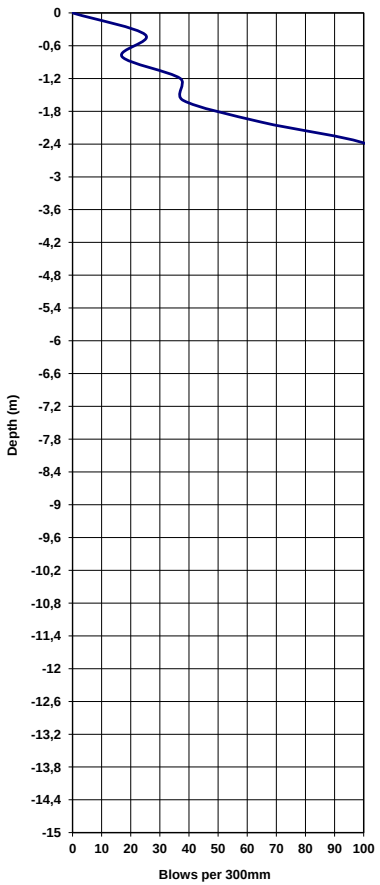
Client:	**Ngoti Development Consultants**	**Ref.No.**	**19-719**
Project:	**Ceres and Klipfontein Development - Bloemfontein**	**Date:**	**2019/08/21**
Section:		**Operator:**	**MJ**

Light Dynamic Penetrometer Probe ---------- ***Test No. DPL 19***

Hammer: 10kg falling 550mm
Cone: 25mm diameter with 60 degree apex angle
Rods: 16mm diameter, 22mm diameter couplings

C=1
Phi=0

Depth metres	Blows per 300mm	Inferred Consistency
0		
0,3	25	Med.Dense
0,6	17	Med.Dense
0,9	37	Med.Dense
1,2	38	Med.Dense
1,5	65	Dense
	Ref	

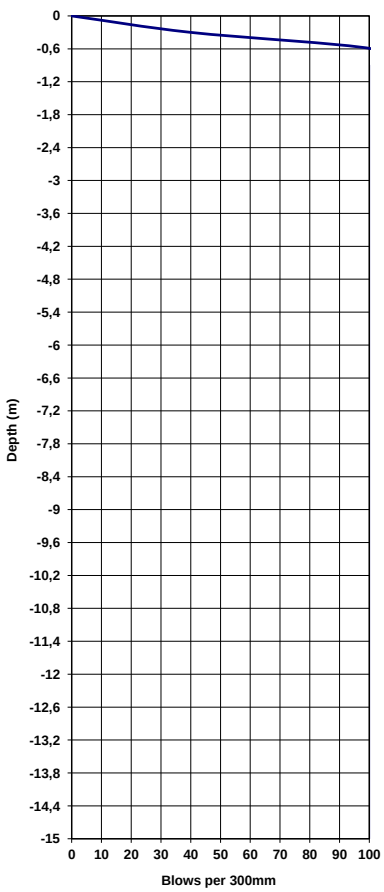


Light Dynamic Penetrometer Probe ---------- ***Test No. DPL 20***

Hammer: 10kg falling 550mm
Cone: 25mm diameter with 60 degree apex angle
Rods: 16mm diameter, 22mm diameter couplings

C=1
Phi=0

Depth metres	Blows per 300mm	Inferred Consistency
0		
0,3	40	Med.Dense
0,6	Ref	



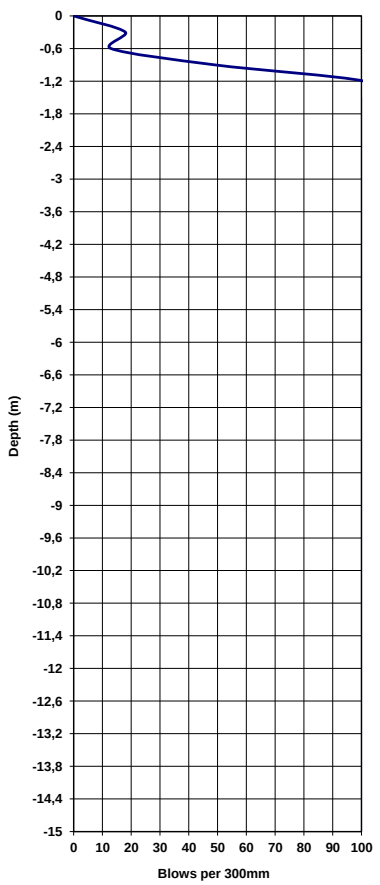
Light Dynamic Penetrometer Probe ---------- ***Test No. DPL 21***

THE INSITU STRENGTH DEPENDS ON SOIL MOISTURE CONTENT AND GRAIN STRUCTURE WHICH HAVE NOT BEEN ASSESSED AND MAY CHANGE. THE VALUES GIVEN ARE THEREFORE INDICATIVE ONLY AND SHOULD BE VERIFIED BY TEST OR OBSERVATION

Hammer: 10kg falling 550mm
Cone: 25mm diameter with 60 degree apex angle
Rods: 16mm diameter, 22mm diameter couplings

C=1
Phi=0

Depth metres	Blows per 300mm	Inferred Consistency
0		
0,3	18	Med.Dense
0,6	13	Loose
1,2	49	Med.Dense
1,5	Ref	



Delta Geotech (Pty) Ltd

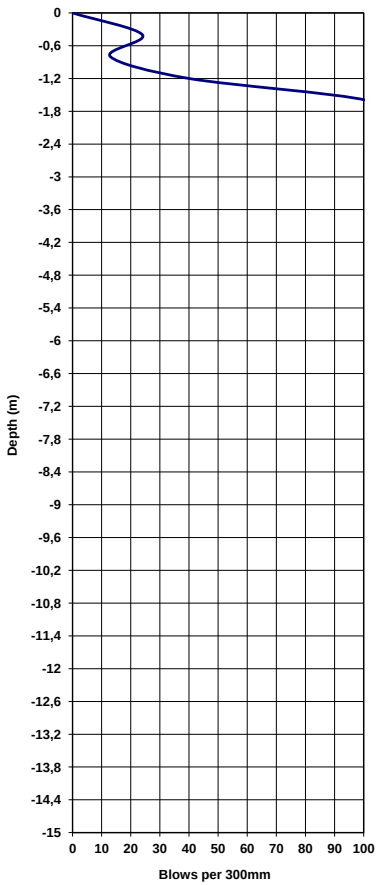
Client:	**Ngoti Development Consultants**	**Ref.No.**	**19-719**
Project:	**Ceres and Klipfontein Development - Bloemfontein**	**Date:**	**2019/08/21**
Section:		**Operator:**	**MJ**

Light Dynamic Penetrometer Probe ---------- ***Test No. DPL 22***

Hammer: 10kg falling 550mm
Cone: 25mm diameter with 60 degree apex angle
Rods: 16mm diameter, 22mm diameter couplings

C=1
Phi=0

Depth metres	Blows per 300mm	Inferred Consistency
0		
0,3	24	Med.Dense
0,6	13	Loose
0,9	40	Med.Dense
1,2	Ref	

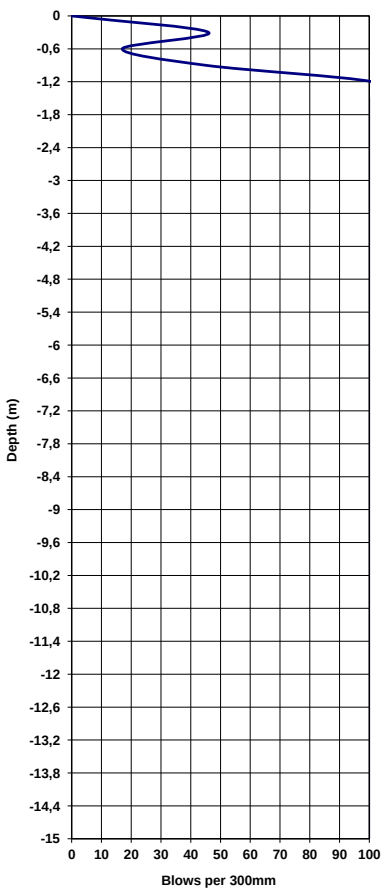


Light Dynamic Penetrometer Probe ---------- ***Test No. DPL 23***

Hammer: 10kg falling 550mm
Cone: 25mm diameter with 60 degree apex angle
Rods: 16mm diameter, 22mm diameter couplings

C=1
Phi=0

Depth metres	Blows per 300mm	Inferred Consistency
0		
0,3	46	Dense
0,6	17	Med.Dense
0,9	45	Dense
1,2	Ref	

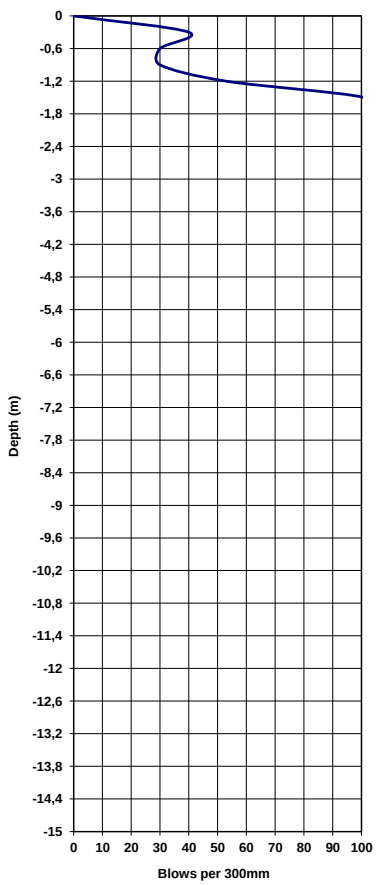


Light Dynamic Penetrometer Probe ---------- ***Test No. DPL 24***

Hammer: 10kg falling 550mm
Cone: 25mm diameter with 60 degree apex angle
Rods: 16mm diameter, 22mm diameter couplings

C=1
Phi=0

Depth metres	Blows per 300mm	Inferred Consistency
0		
0,3	40	Med.Dense
0,6	30	Med.Dense
1,2	30	Loose
1,5	53	Dense
1,8	Ref	



THE INSITU STRENGTH DEPENDS ON SOIL MOISTURE CONTENT AND GRAIN STRUCTURE WHICH HAVE NOT BEEN ASSESSED AND MAY CHANGE. THE VALUES GIVEN ARE THEREFORE INDICATIVE ONLY AND SHOULD BE VERIFIED BY TEST OR OBSERVATION

Delta Geotech (Pty) Ltd

Client:	**Ngoti Development Consultants**	**Ref.No.**	**19-719**
Project:	**Ceres and Klipfontein Development - Bloemfontein**	**Date:**	**2019/08/21**
Section:		**Operator:**	**MJ**

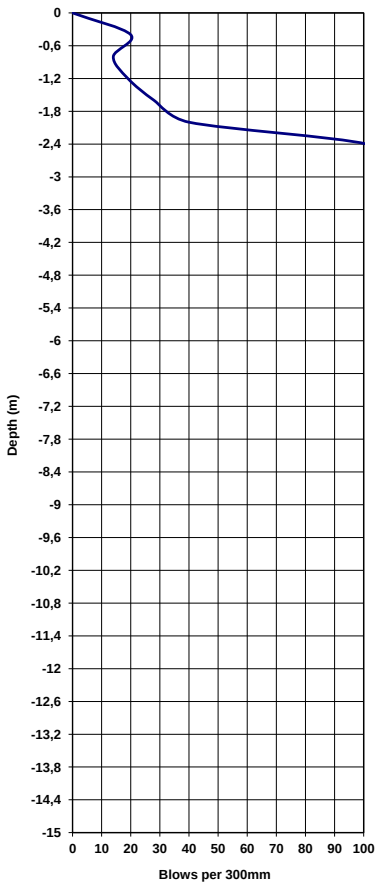
Light Dynamic Penetrometer Probe ---------- ***Test No. DPL 25***

THE INSITU STRENGTH DEPENDS ON SOIL MOISTURE CONTENT AND GRAIN STRUCTURE WHICH HAVE NOT BEEN ASSESSED AND MAY CHANGE. THE VALUES GIVEN ARE THEREFORE INDICATIVE ONLY AND SHOULD BE VERIFIED BY TEST OR OBSERVATION

Hammer: 10kg falling 550mm
Cone: 25mm diameter with 60 degree apex angle
Rods: 16mm diameter, 22mm diameter couplings

C=1
Phi=0

Depth metres	Blows per 300mm	Inferred Consistency
0		
0,3	20	Med.Dense
0,6	14	Loose
0,9	19	Med.Dense
1,2	28	Med.Dense
1,5	40	Med.Dense
1,8	Ref	

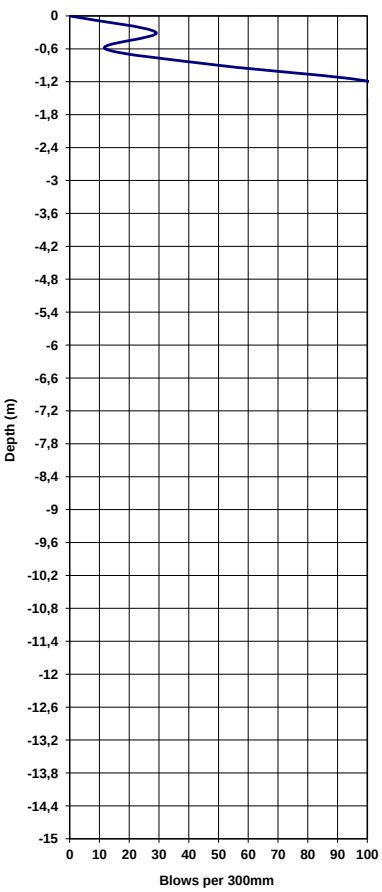


Light Dynamic Penetrometer Probe ---------- ***Test No. DPL 26***

Hammer: 10kg falling 550mm
Cone: 25mm diameter with 60 degree apex angle
Rods: 16mm diameter, 22mm diameter couplings

C=1
Phi=0

Depth metres	Blows per 300mm	Inferred Consistency
0		
0,3	29	Med.Dense
0,6	12	Loose
0,9	50	Dense
1,2	Ref	

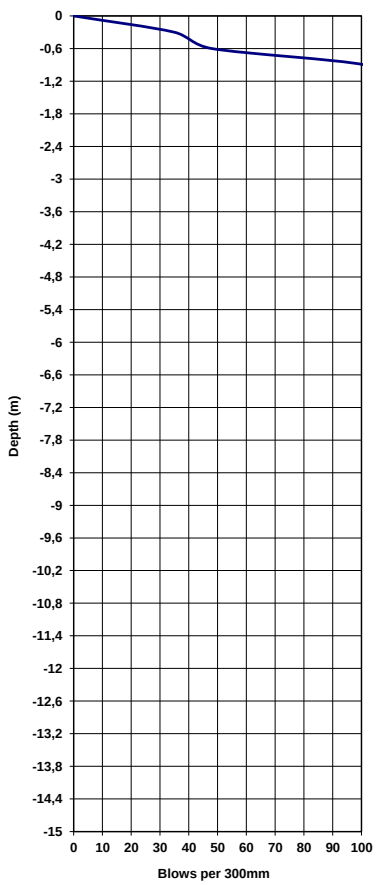


Light Dynamic Penetrometer Probe ---------- ***Test No. DPL 27***

Hammer: 10kg falling 550mm
Cone: 25mm diameter with 60 degree apex angle
Rods: 16mm diameter, 22mm diameter couplings

C=1
Phi=0

Depth metres	Blows per 300mm	Inferred Consistency
0		
0,3	35	Med.Dense
0,6	48	Dense
1,2	Ref	



Delta Geotech (Pty) Ltd

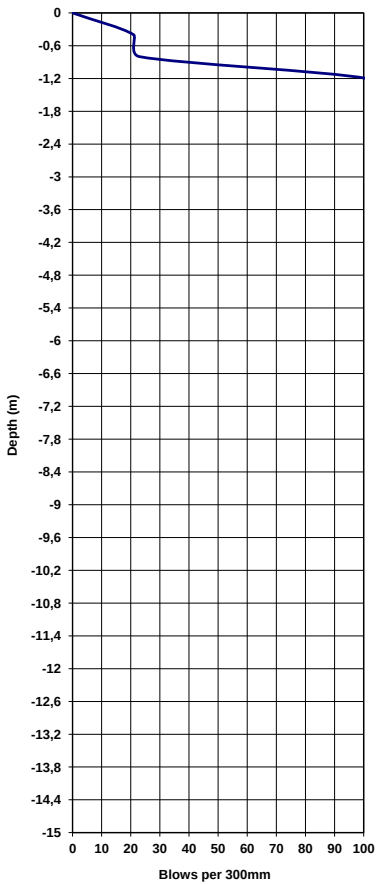
Client:	**Ngoti Development Consultants**	**Ref.No.**	**19-719**
Project:	**Ceres and Klipfontein Development - Bloemfontein**	**Date:**	**2019/08/21**
Section:		**Operator:**	**MJ**

Light Dynamic Penetrometer Probe ---------- ***Test No. DPL 28***

Hammer: 10kg falling 550mm
Cone: 25mm diameter with 60 degree apex angle
Rods: 16mm diameter, 22mm diameter couplings

C=1
Phi=0

Depth metres	Blows per 300mm	Inferred Consistency
0		
0,3	21	Med.Dense
0,6	23	Med.Dense
0,9	Ref	

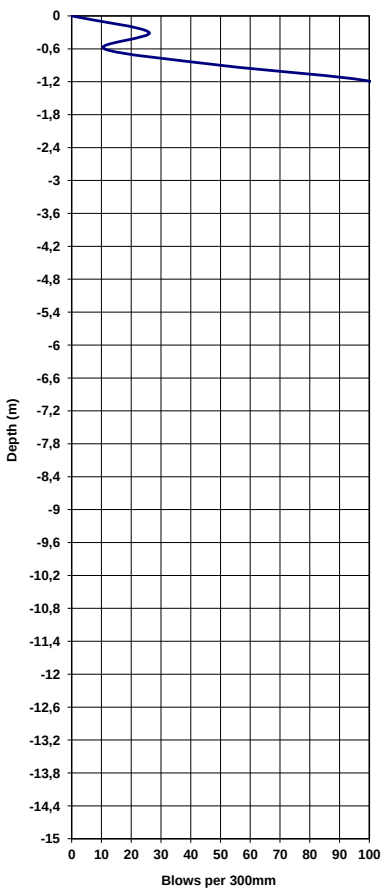


Light Dynamic Penetrometer Probe ---------- ***Test No. DPL 29***

Hammer: 10kg falling 550mm
Cone: 25mm diameter with 60 degree apex angle
Rods: 16mm diameter, 22mm diameter couplings

C=1
Phi=0

Depth metres	Blows per 300mm	Inferred Consistency
0		
0,3	26	Med.Dense
0,6	11	Loose
0,9	50	Dense
1,2	Ref	

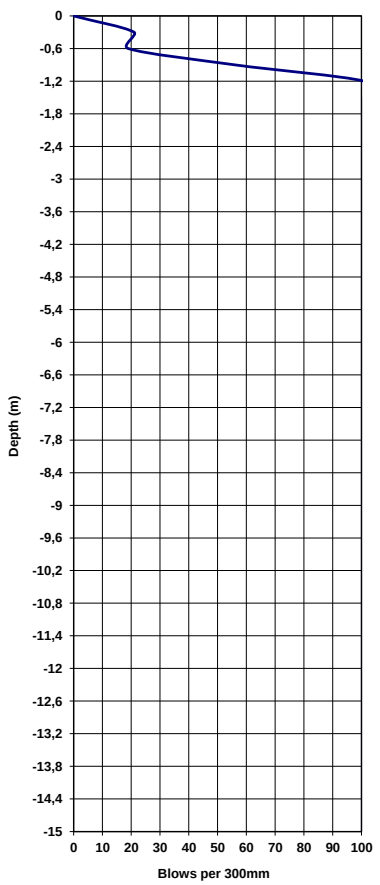


Light Dynamic Penetrometer Probe ---------- ***Test No. DPL 30***

Hammer: 10kg falling 550mm
Cone: 25mm diameter with 60 degree apex angle
Rods: 16mm diameter, 22mm diameter couplings

C=1
Phi=0

Depth metres	Blows per 300mm	Inferred Consistency
0		
0,3	21	Med.Dense
0,6	19	Med.Dense
1,2	56	Med.Dense
1,5	Ref	



THE INSITU STRENGTH DEPENDS ON SOIL MOISTURE CONTENT AND GRAIN STRUCTURE WHICH HAVE NOT BEEN ASSESSED AND MAY CHANGE. THE VALUES GIVEN ARE THEREFORE INDICATIVE ONLY AND SHOULD BE VERIFIED BY TEST OR OBSERVATION

Delta Geotech (Pty) Ltd

Client:	**Ngoti Development Consultants**	**Ref.No.**	**19-719**
Project:	**Ceres and Klipfontein Development - Bloemfontein**	**Date:**	**2019/08/21**
Section:		**Operator:**	**MJ**

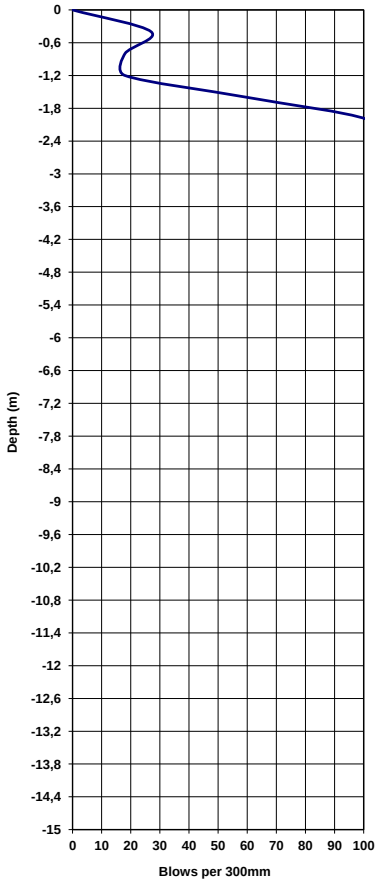
Light Dynamic Penetrometer Probe ---------- ***Test No. DPL 31***

THE INSITU STRENGTH DEPENDS ON SOIL MOISTURE CONTENT AND GRAIN STRUCTURE WHICH HAVE NOT BEEN ASSESSED AND MAY CHANGE. THE VALUES GIVEN ARE THEREFORE INDICATIVE ONLY AND SHOULD BE VERIFIED BY TEST OR OBSERVATION

Hammer: 10kg falling 550mm
Cone: 25mm diameter with 60 degree apex angle
Rods: 16mm diameter, 22mm diameter couplings

C=1
Phi=0

Depth metres	Blows per 300mm	Inferred Consistency
0		
0,3	27	Med.Dense
0,6	18	Med.Dense
0,9	18	Med.Dense
1,2	60	Dense
1,5	Ref	

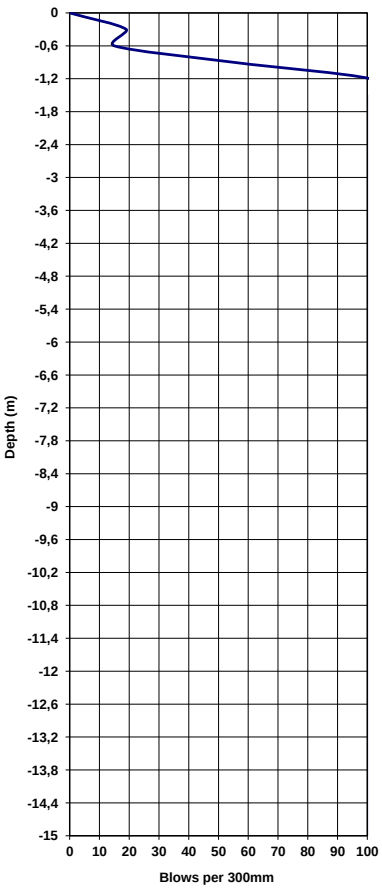


Light Dynamic Penetrometer Probe ---------- ***Test No. DPL 32***

Hammer: 10kg falling 550mm
Cone: 25mm diameter with 60 degree apex angle
Rods: 16mm diameter, 22mm diameter couplings

C=1
Phi=0

Depth metres	Blows per 300mm	Inferred Consistency
0		
0,3	19	Med.Dense
0,6	15	Loose
0,9	55	Dense
1,2	Ref	

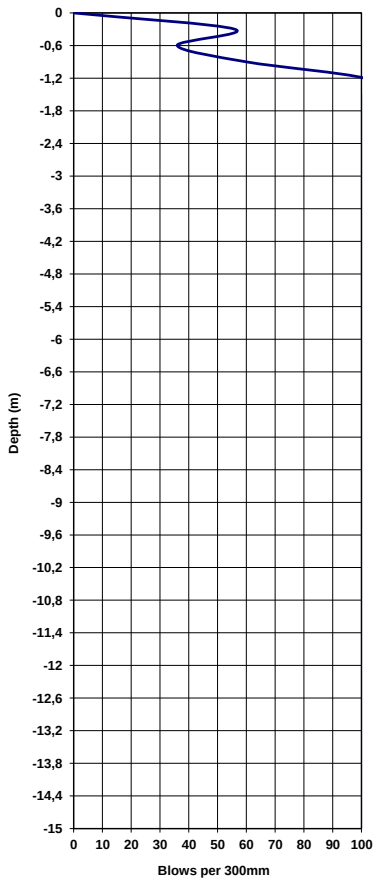


Light Dynamic Penetrometer Probe ---------- ***Test No. DPL 33***

Hammer: 10kg falling 550mm
Cone: 25mm diameter with 60 degree apex angle
Rods: 16mm diameter, 22mm diameter couplings

C=1
Phi=0

Depth metres	Blows per 300mm	Inferred Consistency
0		
0,3	56	Dense
0,6	36	Med.Dense
1,2	60	Med.Dense
1,5	Ref	



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Client:	**Ngoti Development Consultants**	**Ref.No.**	**19-719**
Project:	**Ceres and Klipfontein Development - Bloemfontein**	**Date:**	**2019/08/21**
Section:		**Operator:**	**MJ**

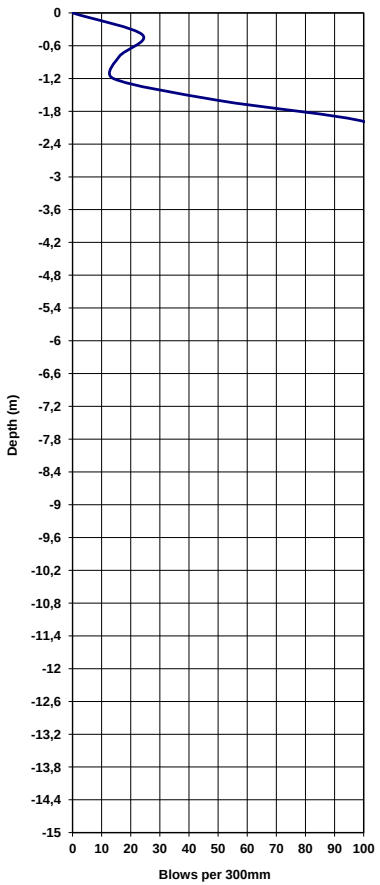
Light Dynamic Penetrometer Probe ---------- ***Test No. DPL 35***

THE INSITU STRENGTH DEPENDS ON SOIL MOISTURE CONTENT AND GRAIN STRUCTURE WHICH HAVE NOT BEEN ASSESSED AND MAY CHANGE. THE VALUES GIVEN ARE THEREFORE INDICATIVE ONLY AND SHOULD BE VERIFIED BY TEST OR OBSERVATION

Hammer: 10kg falling 550mm
Cone: 25mm diameter with 60 degree apex angle
Rods: 16mm diameter, 22mm diameter couplings

C=1
Phi=0

Depth metres	Blows per 300mm	Inferred Consistency
0		
0,3	24	Med.Dense
0,6	16	Med.Dense
0,9	14	Loose
1,2	50	Dense
1,5	Ref	

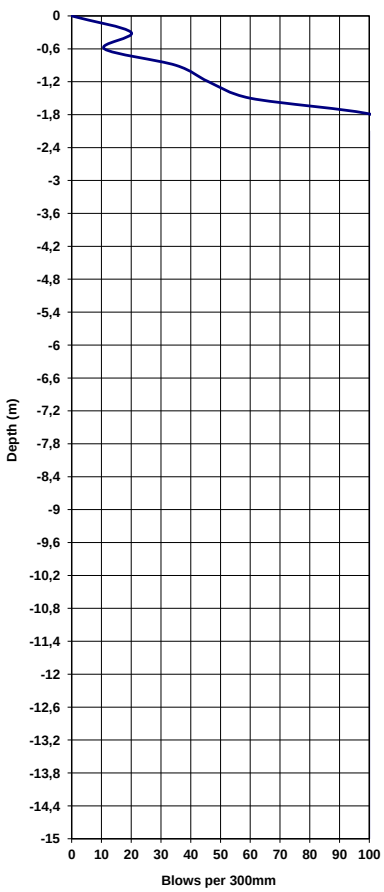


Light Dynamic Penetrometer Probe ---------- ***Test No. DPL 36***

Hammer: 10kg falling 550mm
Cone: 25mm diameter with 60 degree apex angle
Rods: 16mm diameter, 22mm diameter couplings

C=1
Phi=0

Depth metres	Blows per 300mm	Inferred Consistency
0		
0,3	20	Med.Dense
0,6	11	Loose
0,9	35	Med.Dense
1,2	46	Dense
1,5	60	Dense
1,8	Ref	

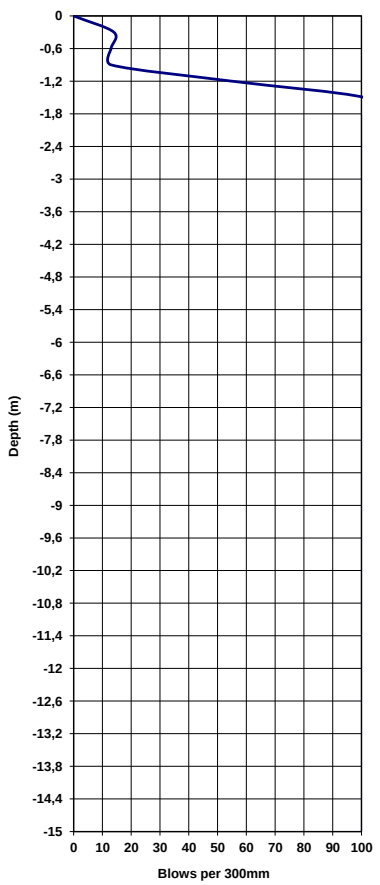


Light Dynamic Penetrometer Probe ---------- ***Test No. DPL 37***

Hammer: 10kg falling 550mm
Cone: 25mm diameter with 60 degree apex angle
Rods: 16mm diameter, 22mm diameter couplings

C=1
Phi=0

Depth metres	Blows per 300mm	Inferred Consistency
0		
0,3	14	Loose
0,6	13	Loose
1,2	13	Very Loose
1,5	55	Dense
1,8	Ref	



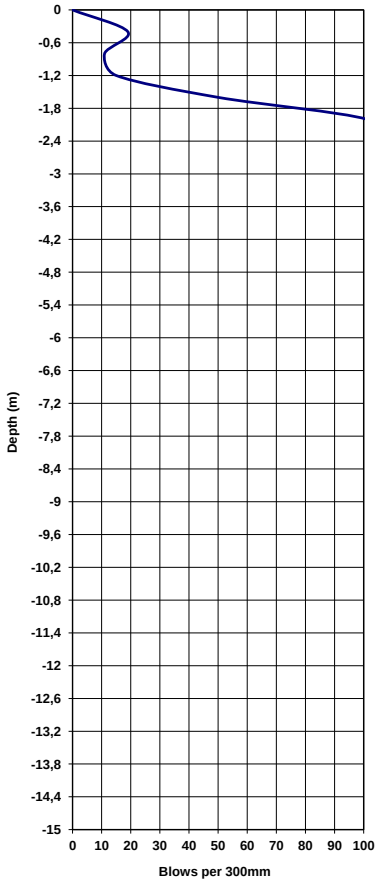
Delta Geotech (Pty) Ltd

Client:	**Ngoti Development Consultants**	**Ref.No.**	**19-719**
Project:	**Ceres and Klipfontein Development - Bloemfontein**	**Date:**	**2019/08/21**
Section:		**Operator:**	**MJ**

Light Dynamic Penetrometer Probe ---------- ***Test No. DPL 38***

Hammer: 10kg falling 550mm
Cone: 25mm diameter with 60 degree apex angle
Rods: 16mm diameter, 22mm diameter couplings
C=1
Phi=0

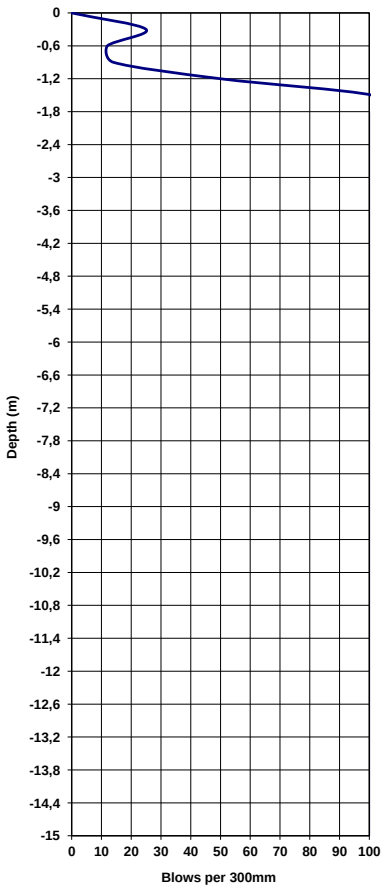
Depth metres	Blows per 300mm	Inferred Consistency
0		
0,3	19	Med.Dense
0,6	11	Loose
0,9	15	Loose
1,2	50	Dense
1,5	Ref	



Light Dynamic Penetrometer Probe ---------- ***Test No. DPL 39***

Hammer: 10kg falling 550mm
Cone: 25mm diameter with 60 degree apex angle
Rods: 16mm diameter, 22mm diameter couplings
C=1
Phi=0

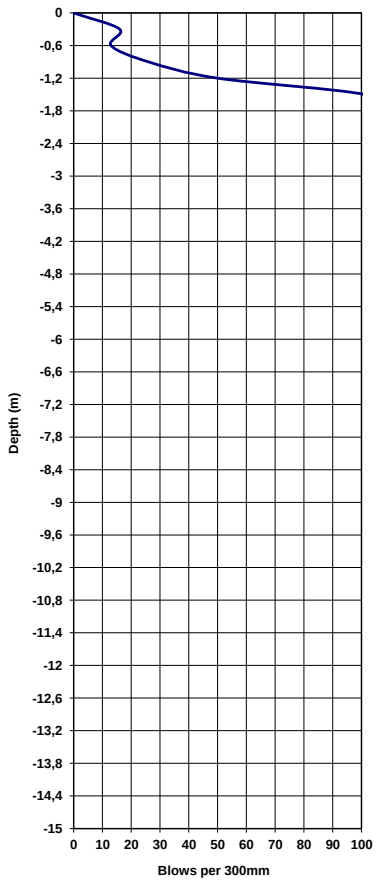
Depth metres	Blows per 300mm	Inferred Consistency
0		
0,3	25	Med.Dense
0,6	12	Loose
0,9	14	Loose
1,2	50	Dense
1,5	Ref	



Light Dynamic Penetrometer Probe ---------- ***Test No. DPL 40***

Hammer: 10kg falling 550mm
Cone: 25mm diameter with 60 degree apex angle
Rods: 16mm diameter, 22mm diameter couplings
C=1
Phi=0

Depth metres	Blows per 300mm	Inferred Consistency
0		
0,3	16	Med.Dense
0,6	13	Loose
1,2	26	Loose
1,5	50	Dense
1,8	Ref	



THE INSITU STRENGTH DEPENDS ON SOIL MOISTURE CONTENT AND GRAIN STRUCTURE WHICH HAVE NOT BEEN ASSESSED AND MAY CHANGE. THE VALUES GIVEN ARE THEREFORE INDICATIVE ONLY AND SHOULD BE VERIFIED BY TEST OR OBSERVATION

Delta Geotech (Pty) Ltd

Client:	**Ngoti Development Consultants**	**Ref.No.**	**19-719**
Project:	**Ceres and Klipfontein Development - Bloemfontein**	**Date:**	**2019/08/21**
Section:		**Operator:**	**MJ**

Light Dynamic Penetrometer Probe ---------- ***Test No. DPL 41***

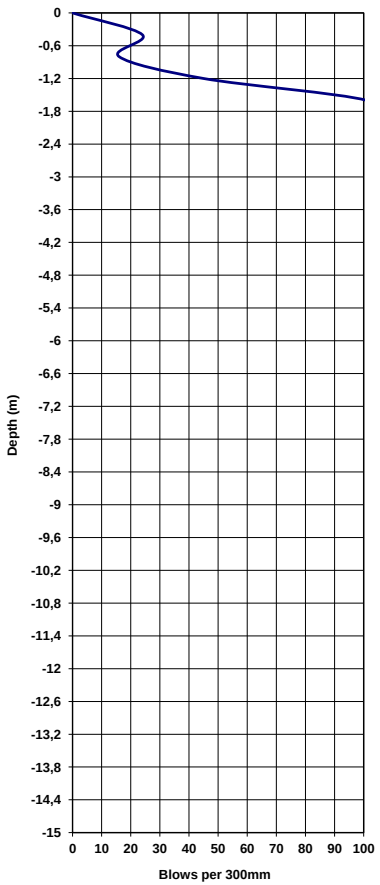
Light Dynamic Penetrometer Probe ---------- ***Test No. DPL 42***

Light Dynamic Penetrometer Probe ---------- ***Test No. DPL 43***

THE INSITU STRENGTH DEPENDS ON SOIL MOISTURE CONTENT AND GRAIN STRUCTURE WHICH HAVE NOT BEEN ASSESSED AND MAY CHANGE. THE VALUES GIVEN ARE THEREFORE INDICATIVE ONLY AND SHOULD BE VERIFIED BY TEST OR OBSERVATION

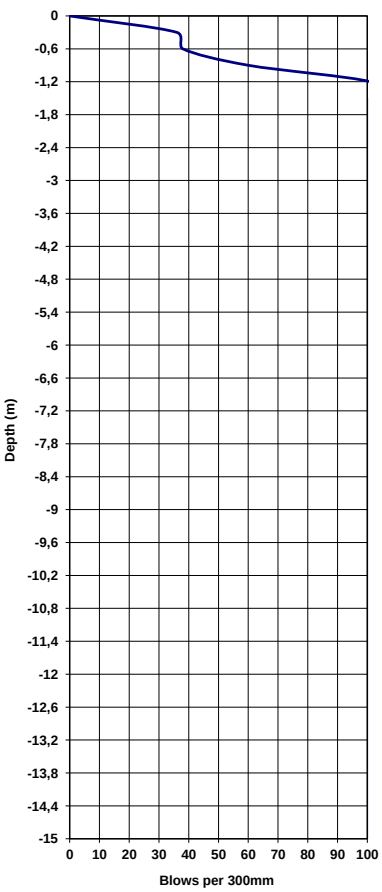
Hammer: 10kg falling 550mm
Cone: 25mm diameter with 60 degree apex angle
Rods: 16mm diameter, 22mm diameter couplings
C=1
Phi=0

Depth metres	Blows per 300mm	Inferred Consistency
0		
0,3	24	Med.Dense
0,6	16	Med.Dense
0,9	45	Dense
1,2	Ref	



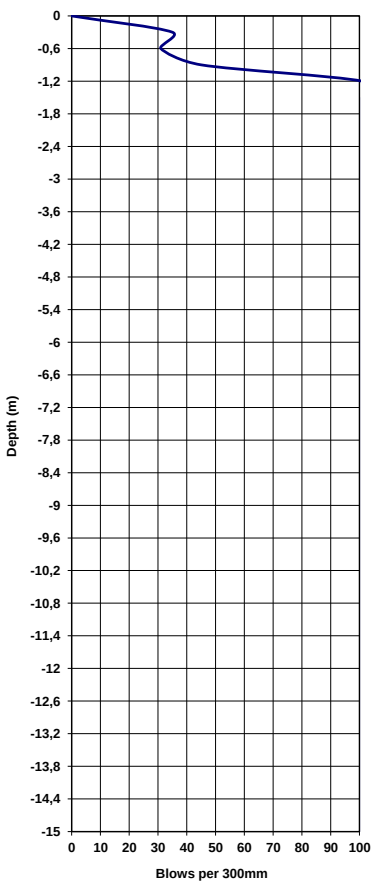
Hammer: 10kg falling 550mm
Cone: 25mm diameter with 60 degree apex angle
Rods: 16mm diameter, 22mm diameter couplings
C=1
Phi=0

Depth metres	Blows per 300mm	Inferred Consistency
0		
0,3	36	Med.Dense
0,6	38	Med.Dense
0,9	60	Dense
1,2	Ref	



Hammer: 10kg falling 550mm
Cone: 25mm diameter with 60 degree apex angle
Rods: 16mm diameter, 22mm diameter couplings
C=1
Phi=0

Depth metres	Blows per 300mm	Inferred Consistency
0		
0,3	35	Med.Dense
0,6	31	Med.Dense
1,2	45	Med.Dense
1,5	Ref	



Delta Geotech (Pty) Ltd

Client:	**Ngoti Development Consultants**	**Ref.No.**	**19-719**
Project:	**Ceres and Klipfontein Development - Bloemfontein**	**Date:**	**2019/08/21**
Section:		**Operator:**	**MJ**

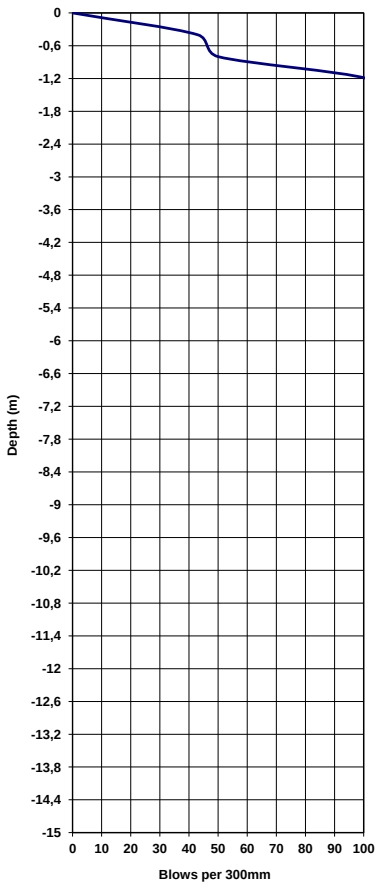
Light Dynamic Penetrometer Probe ---------- ***Test No. DPL 44***

THE INSITU STRENGTH DEPENDS ON SOIL MOISTURE CONTENT AND GRAIN STRUCTURE WHICH HAVE NOT BEEN ASSESSED AND MAY CHANGE. THE VALUES GIVEN ARE THEREFORE INDICATIVE ONLY AND SHOULD BE VERIFIED BY TEST OR OBSERVATION

Hammer: 10kg falling 550mm
Cone: 25mm diameter with 60 degree apex angle
Rods: 16mm diameter, 22mm diameter couplings

C=1
Phi=0

Depth metres	Blows per 300mm	Inferred Consistency
0		
0,3	43	Dense
0,6	50	Dense
0,9	Ref	

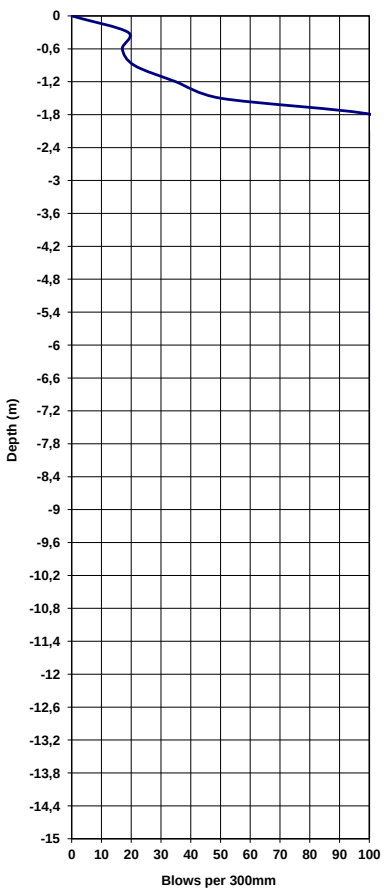


Light Dynamic Penetrometer Probe ---------- ***Test No. DPL 45***

Hammer: 10kg falling 550mm
Cone: 25mm diameter with 60 degree apex angle
Rods: 16mm diameter, 22mm diameter couplings

C=1
Phi=0

Depth metres	Blows per 300mm	Inferred Consistency
0		
0,3	19	Med.Dense
0,6	17	Med.Dense
0,9	21	Med.Dense
1,2	35	Med.Dense
1,5	50	Dense
1,9	Ref	

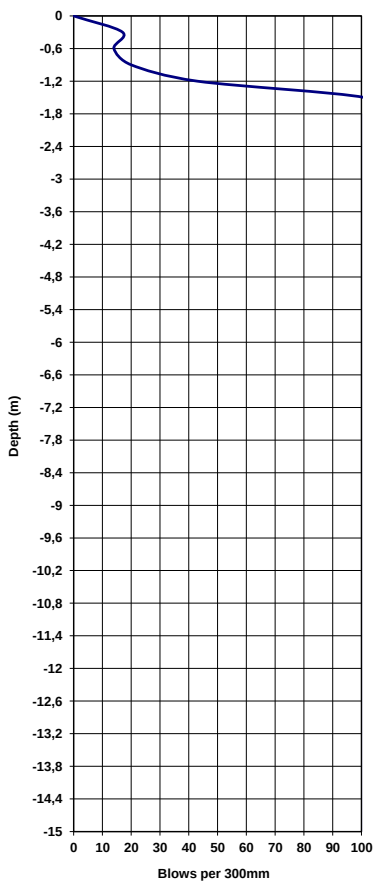


Light Dynamic Penetrometer Probe ---------- ***Test No. DPL 46***

Hammer: 10kg falling 550mm
Cone: 25mm diameter with 60 degree apex angle
Rods: 16mm diameter, 22mm diameter couplings

C=1
Phi=0

Depth metres	Blows per 300mm	Inferred Consistency
0		
0,3	17	Med.Dense
0,6	14	Loose
1,2	20	Loose
1,5	43	Dense
1,9	Ref	



Delta Geotech (Pty) Ltd

Client:	**Ngoti Development Consultants**	**Ref.No.**	**19-719**
Project:	**Ceres and Klipfontein Development - Bloemfontein**	**Date:**	**2019/08/21**
Section:		**Operator:**	**MJ**

Light Dynamic Penetrometer Probe ---------- ***Test No. DPL 47***

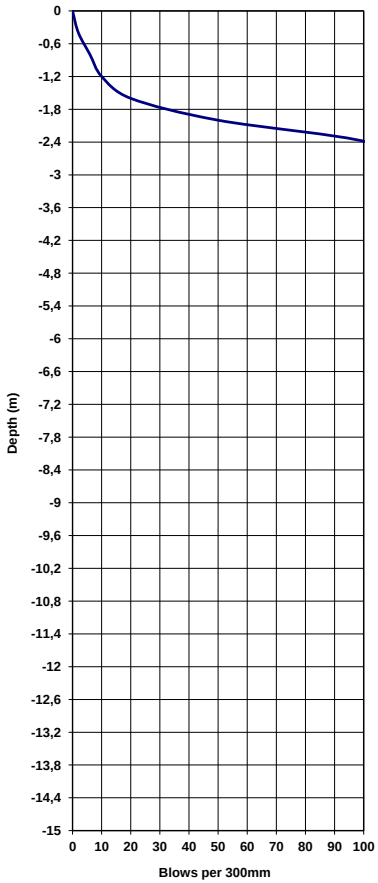
THE INSITU STRENGTH DEPENDS ON SOIL MOISTURE CONTENT AND GRAIN STRUCTURE WHICH HAVE NOT BEEN ASSESSED AND MAY CHANGE. THE VALUES GIVEN ARE THEREFORE INDICATIVE ONLY AND SHOULD BE VERIFIED BY TEST OR OBSERVATION

Hammer: 10kg falling 550mm
Cone: 25mm diameter with 60 degree apex angle
Rods: 16mm diameter, 22mm diameter couplings

C=1
Phi=0

Depth metres	Blows per 300mm	Inferred Consistency
0		
0,3	2	Very Loose
0,6	6	Very Loose
0,9	10	Loose
1,2	20	Med.Dense
1,5	50	Dense
1,9	Ref	

200mm above ground on ant hill

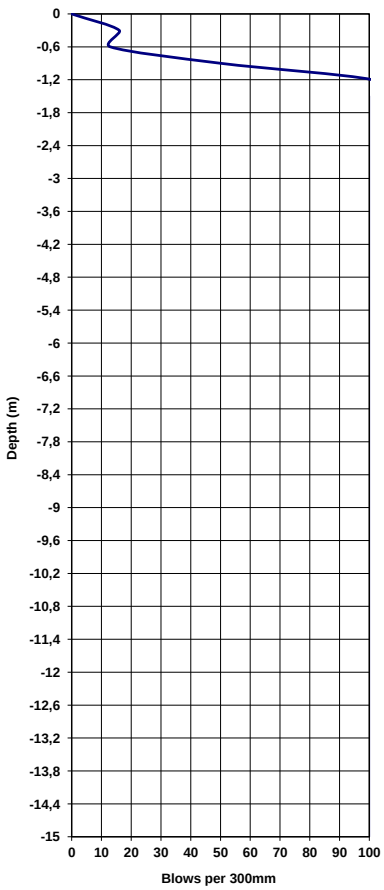


Light Dynamic Penetrometer Probe ---------- ***Test No. DPL 48***

Hammer: 10kg falling 550mm
Cone: 25mm diameter with 60 degree apex angle
Rods: 16mm diameter, 22mm diameter couplings

C=1
Phi=0

Depth metres	Blows per 300mm	Inferred Consistency
0		
0,3	16	Med.Dense
0,6	13	Loose
0,9	50	Dense
1,2	Ref	

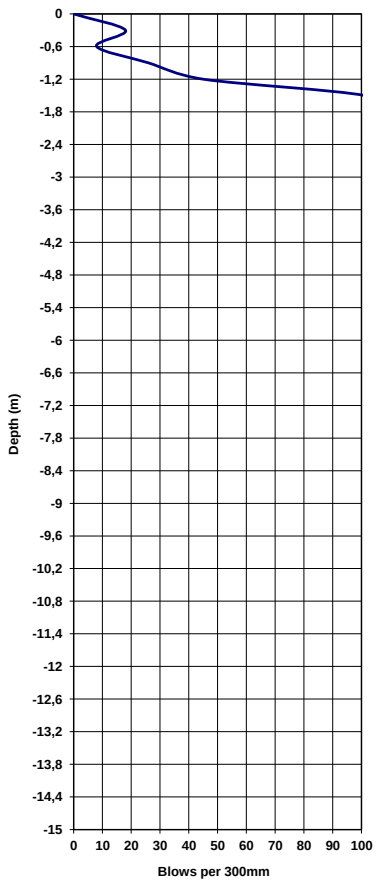


Light Dynamic Penetrometer Probe ---------- ***Test No. DPL 49***

Hammer: 10kg falling 550mm
Cone: 25mm diameter with 60 degree apex angle
Rods: 16mm diameter, 22mm diameter couplings

C=1
Phi=0

Depth metres	Blows per 300mm	Inferred Consistency
0		
0,3	18	Med.Dense
0,6	8	Loose
1,2	26	Loose
1,5	45	Dense
1,9	Ref	



Delta Geotech (Pty) Ltd

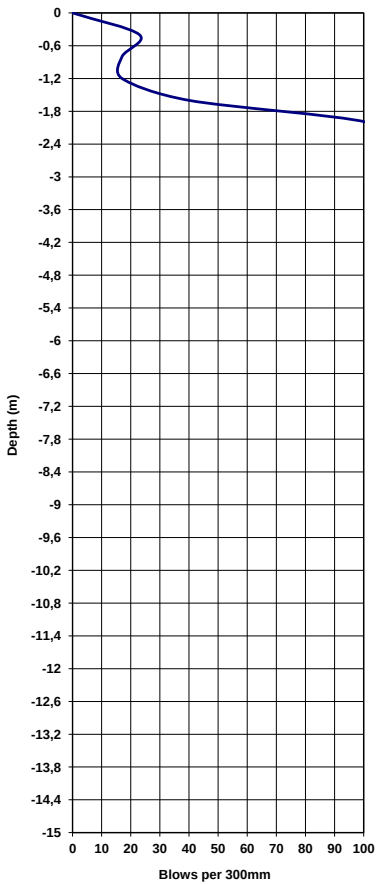
Client:	**Ngoti Development Consultants**	**Ref.No.**	**19-719**
Project:	**Ceres and Klipfontein Development - Bloemfontein**	**Date:**	**2019/08/21**
Section:		**Operator:**	**MJ**

Light Dynamic Penetrometer Probe ---------- ***Test No. DPL 50***

Hammer: 10kg falling 550mm
Cone: 25mm diameter with 60 degree apex angle
Rods: 16mm diameter, 22mm diameter couplings

C=1
Phi=0

Depth metres	Blows per 300mm	Inferred Consistency
0		
0,3	23	Med.Dense
0,6	17	Med.Dense
0,9	17	Med.Dense
1,2	40	Med.Dense
1,5	Ref	

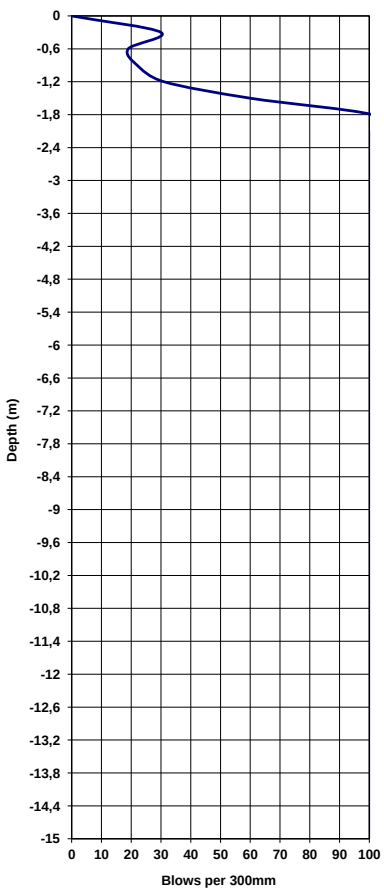


Light Dynamic Penetrometer Probe ---------- ***Test No. DPL 51***

Hammer: 10kg falling 550mm
Cone: 25mm diameter with 60 degree apex angle
Rods: 16mm diameter, 22mm diameter couplings

C=1
Phi=0

Depth metres	Blows per 300mm	Inferred Consistency
0		
0,3	30	Med.Dense
0,6	19	Med.Dense
0,9	22	Med.Dense
1,2	31	Med.Dense
1,5	60	Dense
1,9	Ref	

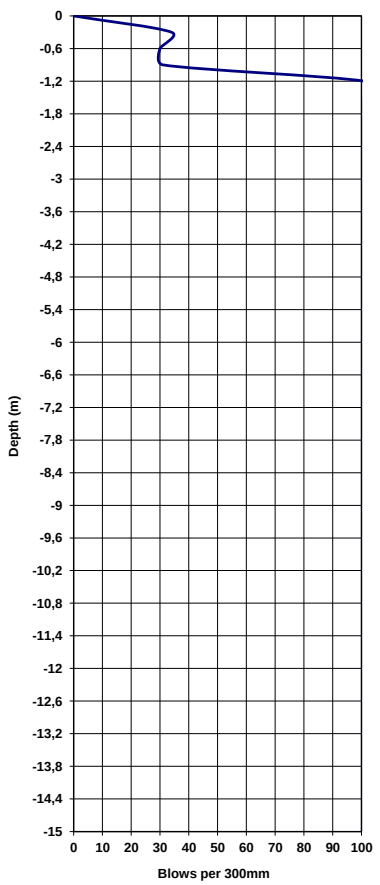


Light Dynamic Penetrometer Probe ---------- ***Test No. DPL 52***

Hammer: 10kg falling 550mm
Cone: 25mm diameter with 60 degree apex angle
Rods: 16mm diameter, 22mm diameter couplings

C=1
Phi=0

Depth metres	Blows per 300mm	Inferred Consistency
0		
0,3	34	Med.Dense
0,6	30	Med.Dense
1,2	31	Loose
1,5	Ref	



THE INSITU STRENGTH DEPENDS ON SOIL MOISTURE CONTENT AND GRAIN STRUCTURE WHICH HAVE NOT BEEN ASSESSED AND MAY CHANGE. THE VALUES GIVEN ARE THEREFORE INDICATIVE ONLY AND SHOULD BE VERIFIED BY TEST OR OBSERVATION

Delta Geotech (Pty) Ltd

Client:	**Ngoti Development Consultants**	**Ref.No.**	**19-719**
Project:	**Ceres and Klipfontein Development - Bloemfontein**	**Date:**	**2019/08/21**
Section:		**Operator:**	**MJ**

Light Dynamic Penetrometer Probe ---------- ***Test No. DPL 53***

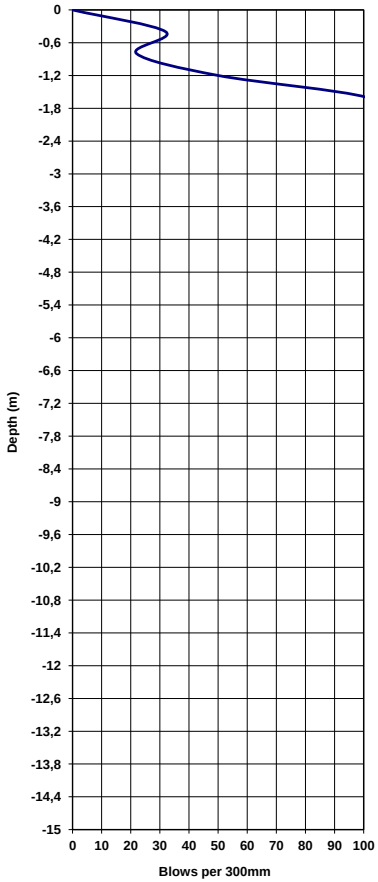
Light Dynamic Penetrometer Probe ---------- ***Test No. DPL 54***

Light Dynamic Penetrometer Probe ---------- ***Test No. DPL 55***

THE INSITU STRENGTH DEPENDS ON SOIL MOISTURE CONTENT AND GRAIN STRUCTURE WHICH HAVE NOT BEEN ASSESSED AND MAY CHANGE. THE VALUES GIVEN ARE THEREFORE INDICATIVE ONLY AND SHOULD BE VERIFIED BY TEST OR OBSERVATION

Hammer: 10kg falling 550mm
Cone: 25mm diameter with 60 degree apex angle
Rods: 16mm diameter, 22mm diameter couplings
C=1
Phi=0

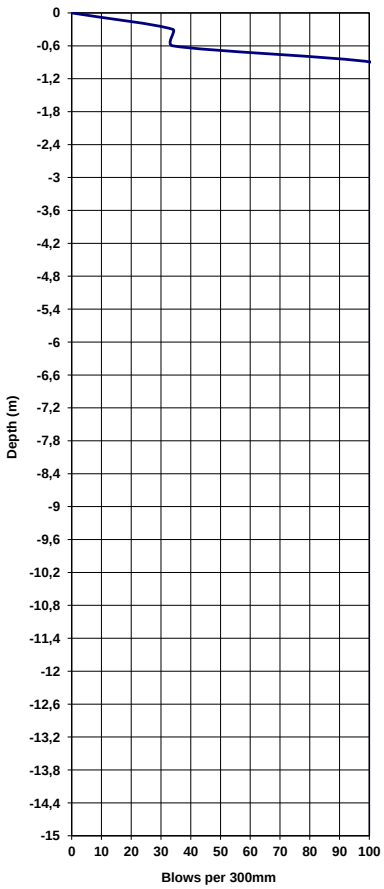
Depth metres	Blows per 300mm	Inferred Consistency
0		
0,3	32	Med.Dense
0,6	22	Med.Dense
0,9	50	Dense
1,2	Ref	
1,5		



Hammer: 10kg falling 550mm
Cone: 25mm diameter with 60 degree apex angle
Rods: 16mm diameter, 22mm diameter couplings
C=1
Phi=0

Depth metres	Blows per 300mm	Inferred Consistency
0		
0,3	34	Med.Dense
0,6	34	Med.Dense
0,9	Ref	

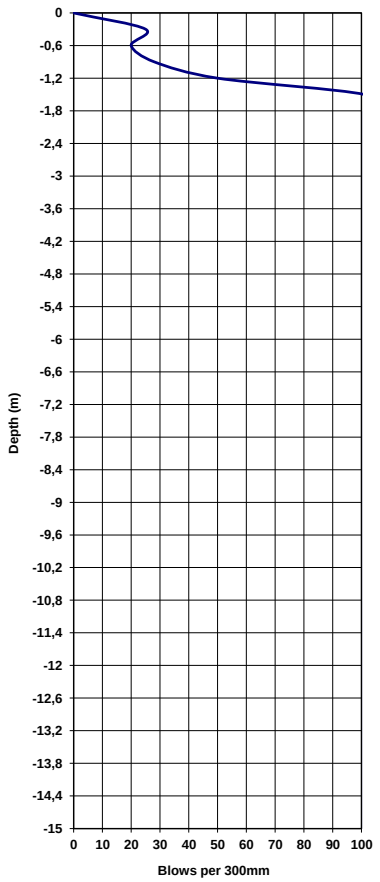
Hammer: 10kg falling 550mm
Cone: 25mm diameter with 60 degree apex angle
Rods: 16mm diameter, 22mm diameter couplings
C=1
Phi=0



Hammer: 10kg falling 550mm
Cone: 25mm diameter with 60 degree apex angle
Rods: 16mm diameter, 22mm diameter couplings
C=1
Phi=0

Depth metres	Blows per 300mm	Inferred Consistency
0		
0,3	25	Med.Dense
0,6	20	Med.Dense
1,2	28	Loose
1,5	50	Dense
	Ref	

Hammer: 10kg falling 550mm
Cone: 25mm diameter with 60 degree apex angle
Rods: 16mm diameter, 22mm diameter couplings
C=1
Phi=0



Delta Geotech (Pty) Ltd

Client:	**Ngoti Development Consultants**	**Ref.No.**	**19-719**
Project:	**Ceres and Klipfontein Development - Bloemfontein**	**Date:**	**2019/08/21**
Section:		**Operator:**	**MJ**

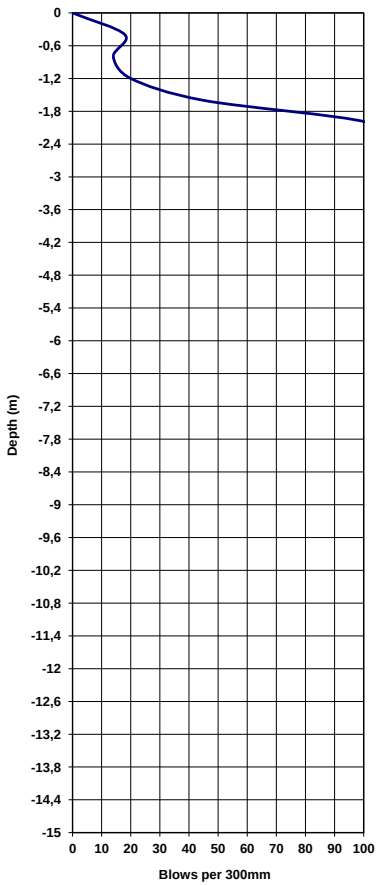
Light Dynamic Penetrometer Probe ---------- ***Test No. DPL 56***

THE INSITU STRENGTH DEPENDS ON SOIL MOISTURE CONTENT AND GRAIN STRUCTURE WHICH HAVE NOT BEEN ASSESSED AND MAY CHANGE. THE VALUES GIVEN ARE THEREFORE INDICATIVE ONLY AND SHOULD BE VERIFIED BY TEST OR OBSERVATION

Hammer: 10kg falling 550mm
Cone: 25mm diameter with 60 degree apex angle
Rods: 16mm diameter, 22mm diameter couplings

C=1
Phi=0

Depth metres	Blows per 300mm	Inferred Consistency
0		
0,3	18	Med.Dense
0,6	14	Loose
0,9	20	Med.Dense
1,2	45	Dense
1,5	Ref	

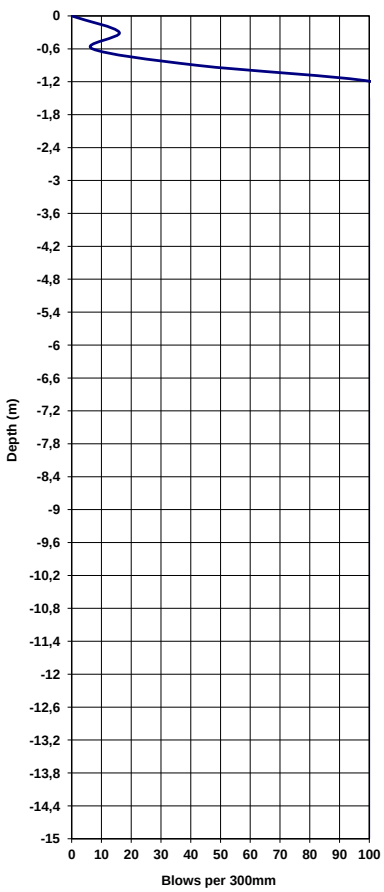


Light Dynamic Penetrometer Probe ---------- ***Test No. DPL 57***

Hammer: 10kg falling 550mm
Cone: 25mm diameter with 60 degree apex angle
Rods: 16mm diameter, 22mm diameter couplings

C=1
Phi=0

Depth metres	Blows per 300mm	Inferred Consistency
0		
0,3	16	Med.Dense
0,6	7	Loose
0,9	42	Dense
	Ref	

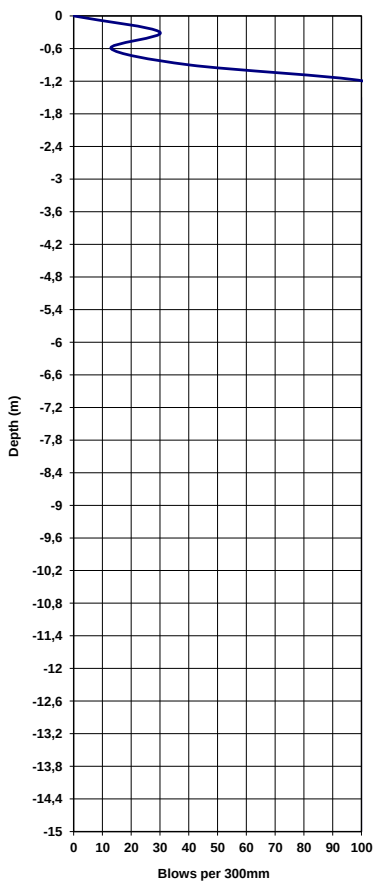


Light Dynamic Penetrometer Probe ---------- ***Test No. DPL 58***

Hammer: 10kg falling 550mm
Cone: 25mm diameter with 60 degree apex angle
Rods: 16mm diameter, 22mm diameter couplings

C=1
Phi=0

Depth metres	Blows per 300mm	Inferred Consistency
0		
0,3	30	Med.Dense
0,6	13	Loose
1,2	40	Med.Dense
1,5	Ref	



Delta Geotech (Pty) Ltd

Client:	**Ngoti Development Consultants**	**Ref.No.**	**19-719**
Project:	**Ceres and Klipfontein Development - Bloemfontein**	**Date:**	**2019/08/21**
Section:		**Operator:**	**MJ**

Light Dynamic Penetrometer Probe ---------- ***Test No. DPL 59***

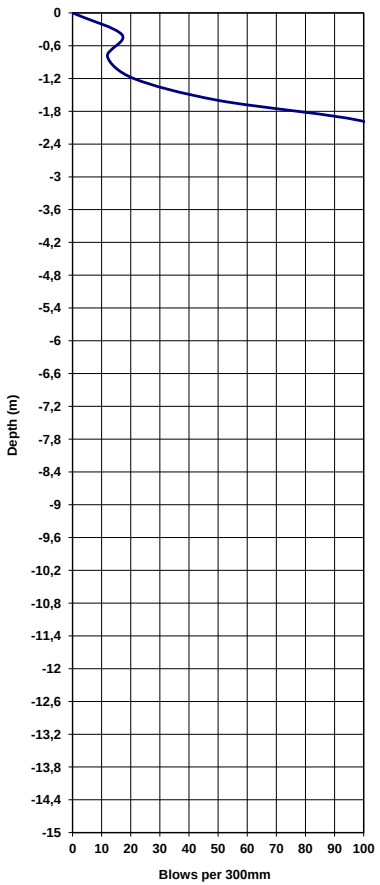
Light Dynamic Penetrometer Probe ---------- ***Test No. DPL 60***

Light Dynamic Penetrometer Probe ---------- ***Test No. DPL***

THE INSITU STRENGTH DEPENDS ON SOIL MOISTURE CONTENT AND GRAIN STRUCTURE WHICH HAVE NOT BEEN ASSESSED AND MAY CHANGE. THE VALUES GIVEN ARE THEREFORE INDICATIVE ONLY AND SHOULD BE VERIFIED BY TEST OR OBSERVATION

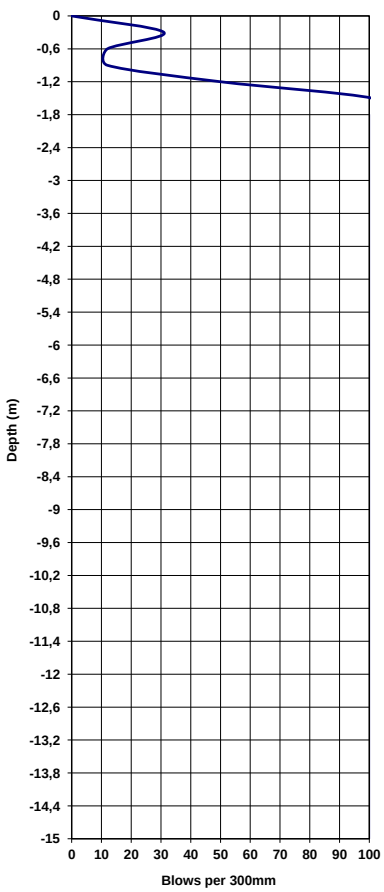
Hammer: 10kg falling 550mm
Cone: 25mm diameter with 60 degree apex angle
Rods: 16mm diameter, 22mm diameter couplings
C=1
Phi=0

Depth metres	Blows per 300mm	Inferred Consistency
0		
0,3	17	Med.Dense
0,6	12	Loose
0,9	21	Med.Dense
1,2	50	Dense
1,5	Ref	



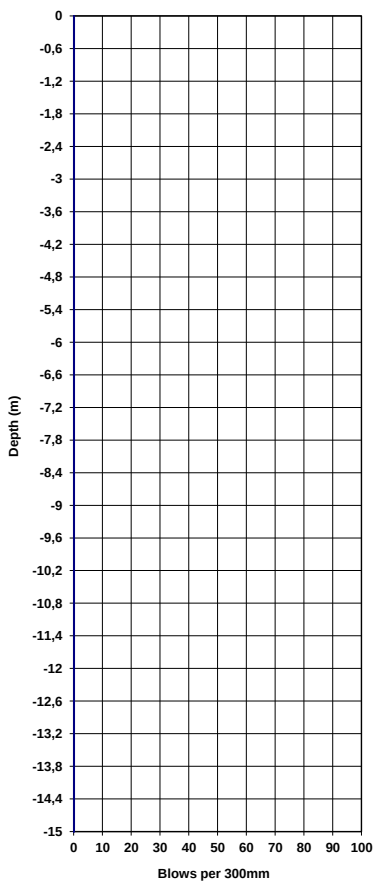
Hammer: 10kg falling 550mm
Cone: 25mm diameter with 60 degree apex angle
Rods: 16mm diameter, 22mm diameter couplings
C=1
Phi=0

Depth metres	Blows per 300mm	Inferred Consistency
0		
0,3	31	Med.Dense
0,6	12	Loose
0,9	12	Loose
1,2	50	Dense
1,5	Ref	



Hammer: 10kg falling 550mm
Cone: 25mm diameter with 60 degree apex angle
Rods: 16mm diameter, 22mm diameter couplings
C=1
Phi=0

Depth metres	Blows per 300mm	Inferred Consistency



APPENDIX - C

Labco
East London Branch – Unit 5 Rivermans Park, C/o B Road & Main Road, Berea Rise, @ PO Box 19151 Vinley Grange 4916

Client	:	Delta Geotech (Pty) Ltd			
Address	:	17 Clearview Place	**Client Reference**	:	
	:	Beacon Bay	**Order No.**	:	
	:	East London			
Attention	:	Mr. M. Jones	**Date Received**	:	23/08/2019
Facsimile	:		**Date Tested**	:	25/09/2019
E-mail	:	matthew@deltageotech.co.za	**Date Reported**	:	25/09/2019
Project	:	Bloemfontein			
Project No.	:	2019-E-891	**Report Status**	:	Final
			Page	:	1 of 11

Herewith please find the test report(s) pertaining to the above project. All tests were conducted in accordance with prescribed test method(s). Information herein consists of the following:

Test(s) conducted / Item(s) measured	Qty.	Test Method(s)	Authorized By**	Page(s)
Atterberg Limits <0.425mm	20	SANS 3001-GR10	N VaN Rool	2-11
Sieve Analysis 0.075mm	20	SANS 3001-GR1	N VaN Rool	2-11
Hydrometer Analysis	20	SANS 3001-GR3*	N VaN Rool	2-11

Any test results contained in this report and marked with * in the table above are "not SANAS accredited" and are not included in the schedule of accreditation for this laboratory.

Any information contained in this test report pertain only to the areas and/or samples tested. Documents may only be reproduced or published in their full context. * Any information gained by the laboratory prior, during or after test process will be treated as confidential and will not be reproduced or disclosed to any person or organization, unless required by law.

All interpretations, Interpolations, Opinions and/or Classifications contained in this report falls outside our scope of accreditation.

The following parameters, where applicable, were excluded from the classification procedure: Chemical modifications, Additional fines, Fractured Faces, Soluble Salts, pH, Conductivity, Coarse Sand Ratio, Durability (COLTO: G4-G9).

The following parameters, where applicable, were assumed: Rock types were assumed to be of an Arenaceous nature with Siliceous cementing material.

Unless otherwise requested or stated, all samples will be discarded after a period of 3 months.

Deviations in Test Methods:

**All results are authorized by technical signatories.

25/09/2019

Technical Signatory

Labco
East London Branch – Unit 6 Bridgetown Park, Cnr 6 Road & Main Road, Beacon Bay – PO Box 10114 Latton Grange 4916
sanas

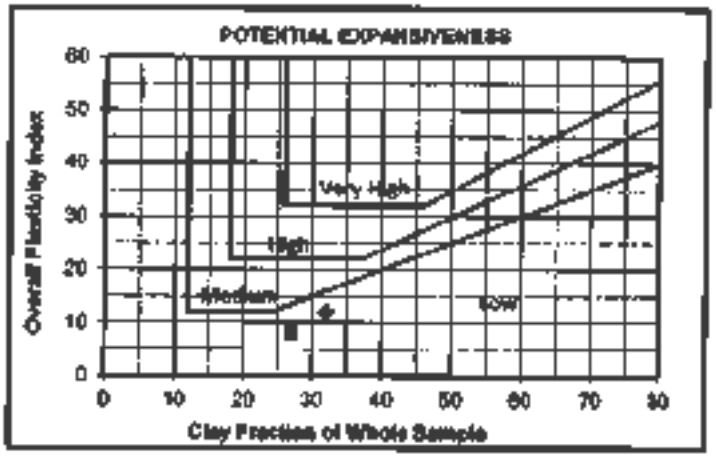
Client	:	Delta Geotech (Pty) Ltd	Date Received:	23/08/2019
Project	:	Bloemfontein	Date Reported:	25/09/2019
Project No	:	2019-E-891	Page No. :	2 of 11

Sampling Method: Samples delivered by client.

Any test results in this report, marked with *, are not included in the schedule of accreditation for this laboratory.

FOUNDATION INDICATOR

Laboratory Number	1 ◆	2 ■
Field Number	E891/1	E891/2
Client Reference		
Depth (m)	0.4	0.5
Position	TP:08	TP:09
Coordinates X		
Coordinates Y		
Description	Red brown Sandy Clay	Brown Clayey Sand
Additional Information		
Calcrete / Crushed Stabilizing Agent		

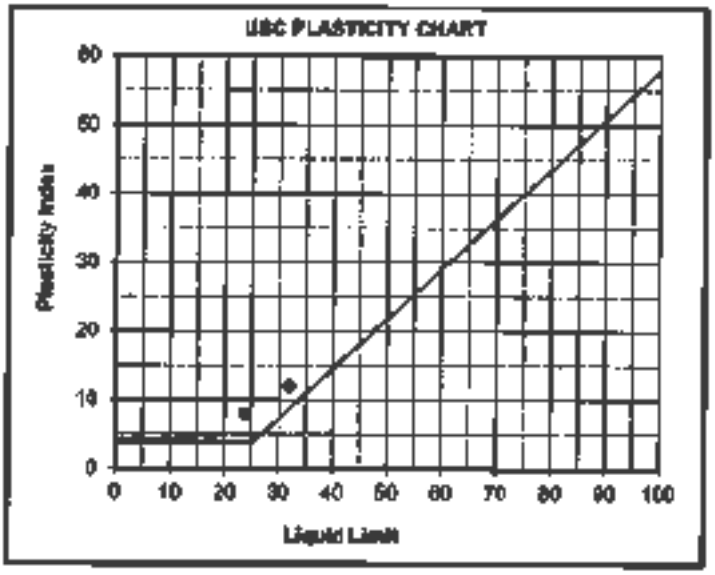


Moisture Content & Relative Density

Moisture Content (%)		
Relative Density (S.G.)		

Sieve Analysis (Wet Prep) SANS 3001-GR1

Percentage Passing	100 mm	100	100
	75 mm	100	100
	63 mm	100	100
	50 mm	100	100
	37.5 mm	100	100
	28 mm	100	100
	20 mm	100	100
	14 mm	100	100
	5 mm	100	100
	2 mm	100	100
	1 mm	100	100
	0.425 mm	100	99
	0.250 mm	97	97
	0.150 mm	84	82
	0.075 mm	51	49
Grading Modulus		0.49	0.52



Hydrometer Analysis* SANS 3001-GR3*

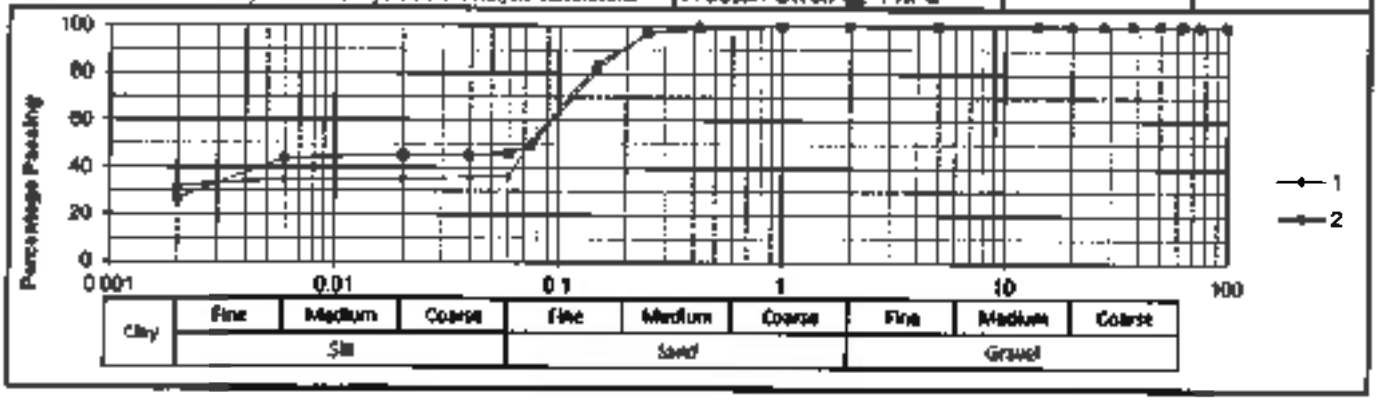
Percentage Passing	0.060 mm	36	46
	0.040 mm	36	45
	0.020 mm	35	45
	0.006 mm	35	44
	0.002 mm	32	27
Gravel	%	0	0
Sand	%	64	54
Silt	%	4	19
Clay	%	32	27

Note: An assumed S.G. may be used in Hydrometer Analysis calculations

Laboratory Number	1 ◆	2 ■
Atterberg Limits -425µ	SANS 3001-GR10	
Liquid Limit %	32	24
Plasticity Index %	12	8
Linear Shrinkage %	6.0	4.0
Overall PI %		

Classifications

HRB (AASHTO)	A-6	A-4
Unified (ASTM D2487)	CL	SC
Weston Swell @ 1 kPa		



Email: info@labco.co.za ■ www.labco.co.za
Email: andy@labco.co.za ■ Phone: +27 (0)43 652 0853
East London Branch – Unit 5 Evergreen Park, Cnr B Road & Main Road, Beacon Bay ■ PO Box 19114 Linton Grange 5616

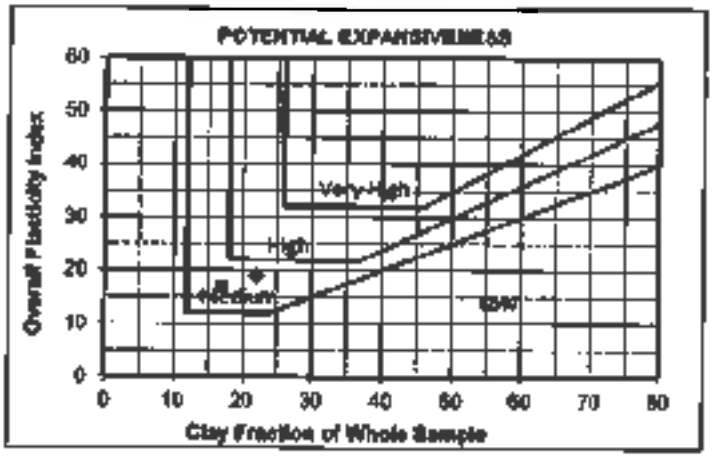
Client	:	Delta Geotech (Pty) Ltd	Date Received:	23/08/2019
Project	:	Bloemfontein	Date Reported:	25/09/2019
Project No	:	2019-E-891	Page No. :	3 of 11

Sampling Method: Samples delivered by client.

Any test results in this report, marked with *, are not included in the schedule of accreditation for this laboratory.

FOUNDATION INDICATOR

Laboratory Number	3 ◆	4 ■
Field Number	E891/3	E891/4
Client Reference		
Depth (m)	0.2	1.9
Position	TP:12	TP:16
Coordinates X		
Coordinates Y		
Description	Black Sandy Clay	Brown Mudstone
Additional Information		
Calcrete / Crushed Stabilizing Agent		

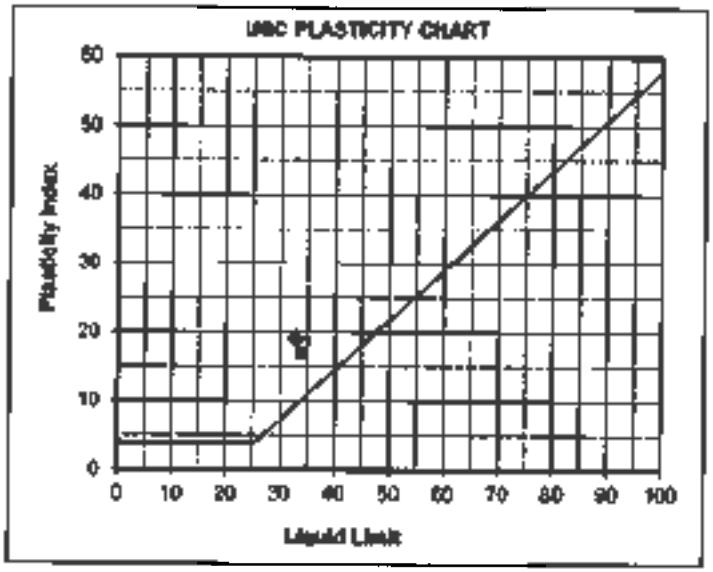


Moisture Content & Relative Density

Moisture Content (%)	...	
Relative Density (S.G.)		

Sieve Analysis (Wet Prep) SANS 3001-GR1

		3 ◆	4 ■
Percentage Passing	100 mm	100	100
	75 mm	100	100
	63 mm	100	100
	50 mm	100	100
	37.5 mm	100	100
	28 mm	100	100
	20 mm	100	100
	14 mm	100	99
	5 mm	100	88
	2 mm	100	55
	1 mm	100	55
	0.425 mm	99	40
	0.250 mm	96	37
	0.150 mm	84	33
	0.075 mm	55	27
Grading Modulus		0.46	1.78



Hydrometer Analysis* SANS 3001-GR3*

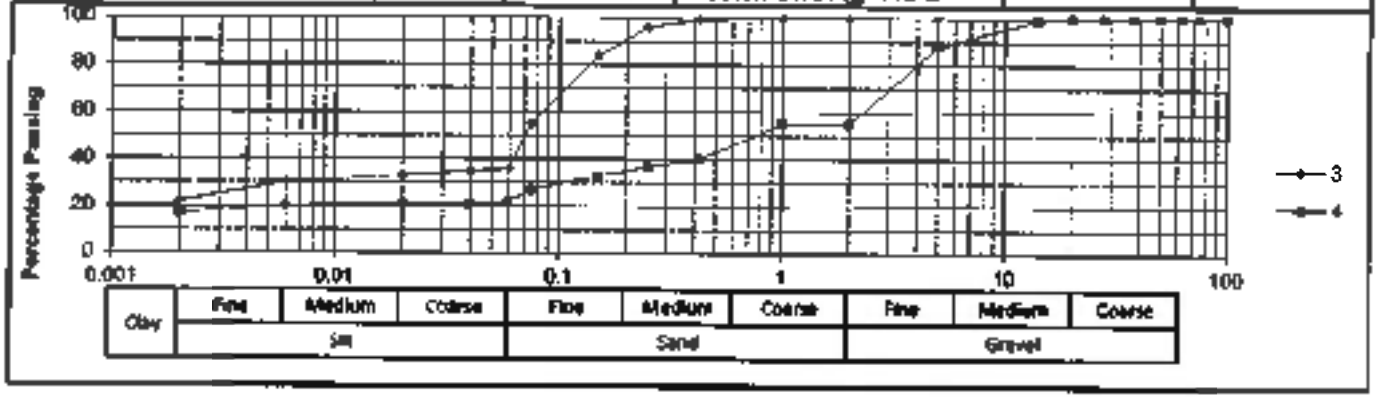
		3 ◆	4 ■
Percentage Passing	0.060 mm	38	22
	0.040 mm	35	21
	0.020 mm	33	21
	0.006 mm	30	20
	0.002 mm	22	17
Gravel	%	0	45
Sand	%	64	33
Silt	%	14	5
Clay	%	22	17

Note. An assumed S.G. may be used in Hydrometer Analysis calculations

Laboratory Number	3 ◆	4 ■
Atterberg Limits -425µ	SANS 3001-GR10	
Liquid Limit %	33	34
Plasticity Index %	19	17
Linear Shrinkage %	8.0	8.0
Overall PI %		

Classifications

HRB (AASHTO)	A-6	A-2-6
Unified (ASTM D2487)	CL	SC
Weston Swell @ 1 kPa		



Labco

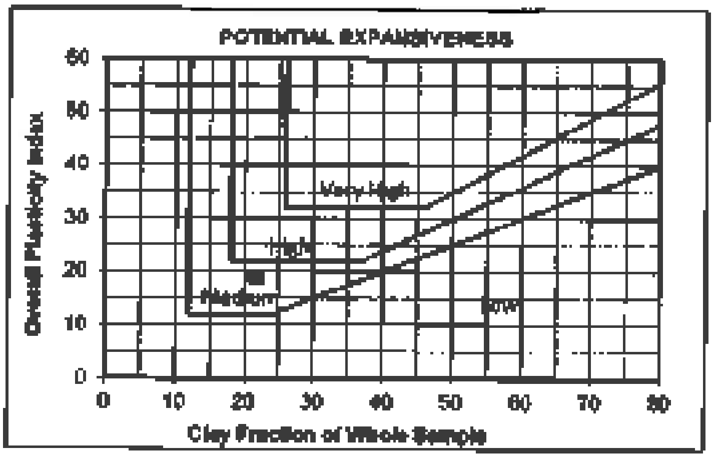
Client	:	Delta Geotech (Pty) Ltd	Date Received:	23/06/2019
Project	:	Bloemfontein	Date Reported:	25/09/2019
Project No	:	2019-E-891	Page No. :	4 of 11

Sampling Method: Samples delivered by client.

Any test results in this report, marked with *, are not included in the schedule of accreditation for this laboratory.

FOUNDATION INDICATOR

Laboratory Number		5 ◆	6 ■
Field Number		E891/5	E891/6
Client Reference			
Depth (m)		0.1	0.4
Position		TP:21	TP:26
Coordinates	X Y	--	--
Description		Red brown Sandy Clay	Olive Sandy Clay
Aditional Information			
Calcrete / Crushed Stabilizing Agent			

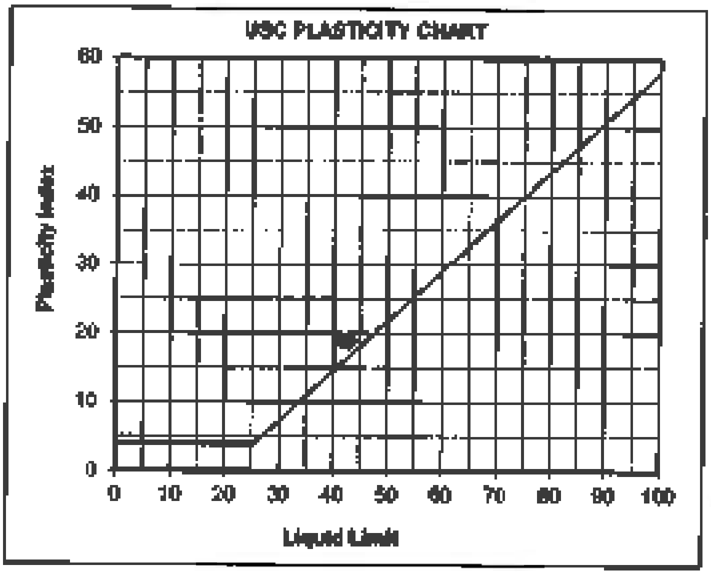


Moisture Content & Relative Density

Moisture Content (%) Relative Density (S.G.)	--	--

Sieve Analysis (Wet Prep) SANS 3001-GR1

		5	6
Percentage Passing	100 mm	100	100
	75 mm	100	100
	63 mm	100	100
	50 mm	100	100
	37.5 mm	100	100
	28 mm	100	100
	20 mm	100	100
	14 mm	100	100
	5 mm	100	100
	2 mm	99	98
	1 mm	99	98
	0.425 mm	98	94
	0.250 mm	97	90
	0.150 mm	86	81
	0.075 mm	69	59
Grading Modulus		0.34	0.49

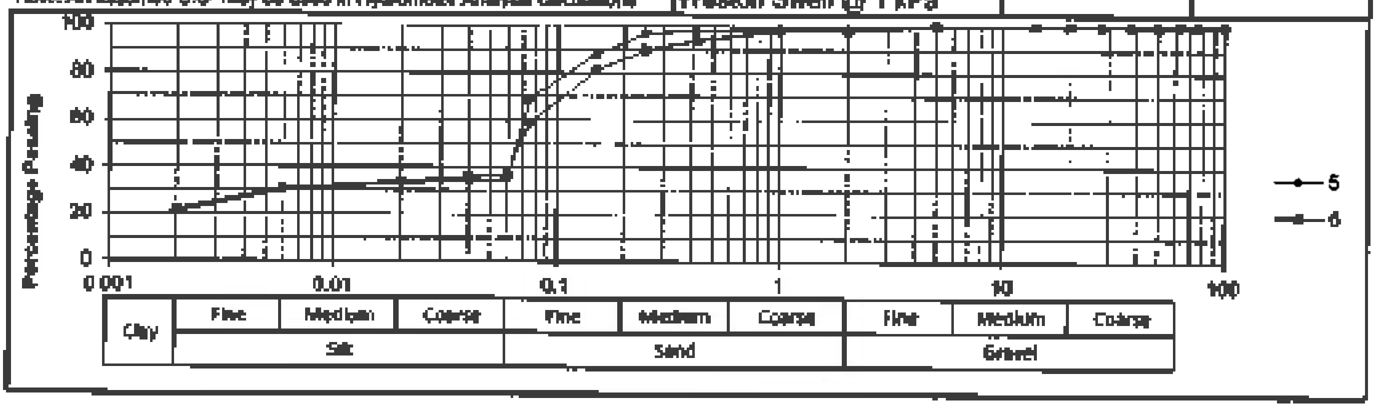


Hydrometer Analysis* SANS 3001-GR3*

			5	6
Percentage Passing	0.060 mm		35	37
	0.040 mm		34	36
	0.020 mm		33	34
	0.006 mm		30	31
	0.002 mm		21	22
Gravel		%	1	2
Sand		%	64	61
Silt		%	14	15
Clay		%	21	22

Note: An assumed S.G. may be used in Hydrometer Analysis calculations

Laboratory Number		5 ◆	6 ■
Atterberg Limits -425μ		SANS 3001-GR10	
Liquid Limit	%	43	42
Plasticity Index	%	19	19
Linear Shrinkage	%	9.5	9.5
Overall PI	%		
Classifications			
HRB (AASHTO)		A-7-6	A-7-6
Unified (ASTM D2487)		CL	CL
Weston Swell @ 1 kPa			



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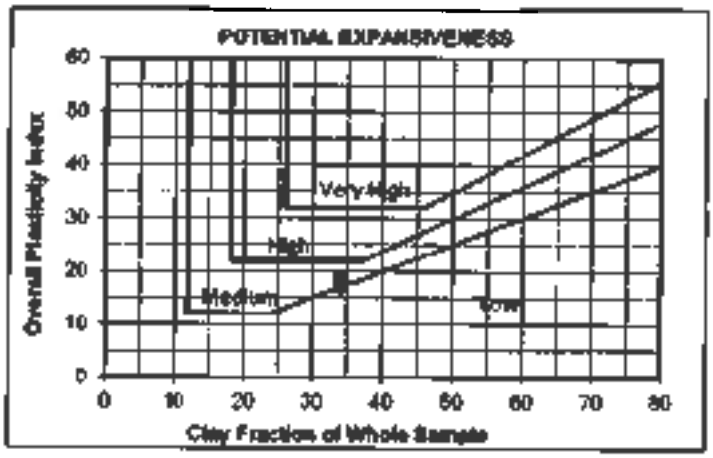
Client	:	Delta Geotech (Pty) Ltd	Date Received:	23/08/2019
Project	:	Bloemfontein	Date Reported:	25/09/2019
Project No	:	2019-E-891	Page No. :	6 of 11

Sampling Method: Samples delivered by client.

Any test results in this report, marked with *, are not included in the schedule of accreditation for this laboratory.

FOUNDATION INDICATOR

Laboratory Number	7 ◆	8 ■
Field Number	E891/7	E891/8
Client Reference		
Depth (m)	0.1	0.2
Position	TP:03	TP:32
Coordinates X		
Coordinates Y		
Description	Brown Sandy Clay	Olive Sandy Clay
Additional Information		
Calcrete / Crushed Stabilizing Agent		

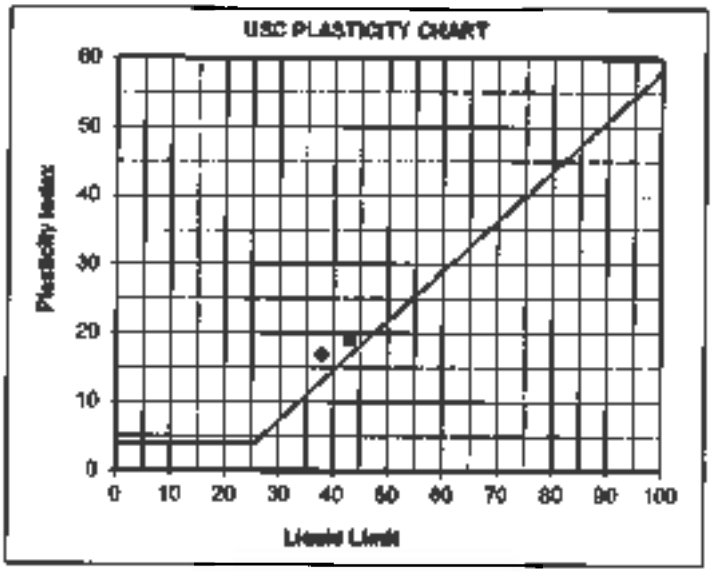


Moisture Content & Relative Density

Moisture Content (%)		
Relative Density (S.G.)		

Sieve Analysis (Wet Prep) — SANS 3001-GR1

		7 ◆	8 ■
Percentage Passing	100 mm	100	100
	75 mm	100	100
	63 mm	100	100
	50 mm	100	100
	37.5 mm	100	100
	28 mm	100	100
	20 mm	100	100
	14 mm	100	100
	5 mm	100	99
	2 mm	100	97
	1 mm	100	97
	0.425 mm	99	96
	0.250 mm	97	94
	0.150 mm	66	87
	0.075 mm	59	67
Grading Modulus		0.43	0.40



Hydrometer Analysis* — SANS 3001-GR3*

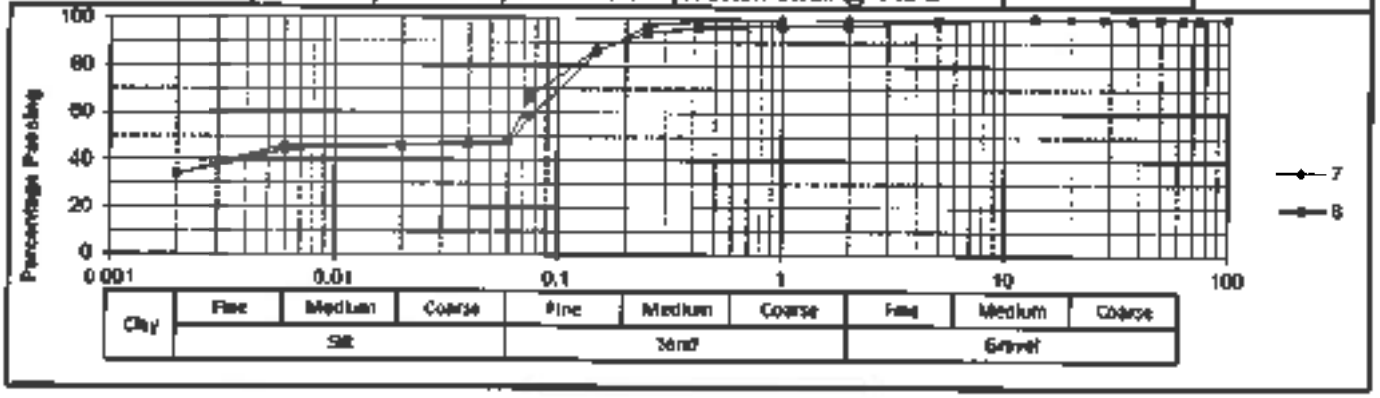
		7 ◆	8 ■
Percentage Passing	0.060 mm	47	48
	0.040 mm	47	47
	0.020 mm	46	46
	0.006 mm	46	44
	0.002 mm	34	34
Gravel	%	0	3
Sand	%	53	49
Silt	%	13	14
Clay	%	34	34

Note: An assumed S.G. may be used in Hydrometer Analysis calculations

Laboratory Number	7 ◆	8 ■
Atterberg Limits -425µ		**SANS 3001-GR10**
Liquid Limit %	58	43
Plasticity Index %	17	19
Linear Shrinkage %	8.5	9.5
Overall PI %		

Classifications

HRB (AASHTO)	A-6	A-7-6
Unified (ASTM D2487)	CL	CL
Weston Swell @ 1 kPa		



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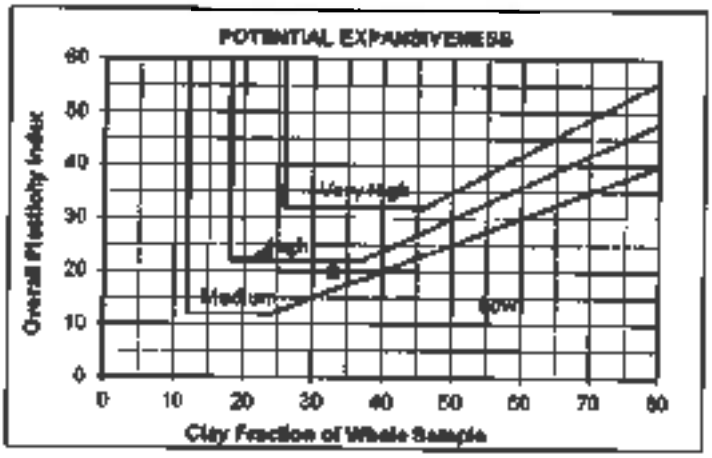
Client	Delta Geotech (Pty) Ltd	Date Received:	23/08/2019
Project	Bloemfontein	Date Reported:	25/09/2019
Project No	2019-E-691	Page No. :	6 of 11

Sampling Method: Samples delivered by client.

Any test results in this report, marked with *, are not included in the schedule of accreditation for this laboratory.

FOUNDATION INDICATOR

Laboratory Number	9 ◆	10 ■
Field Number	E691/9	E691/10
Client Reference		
Depth (m)	0.2	0.7
Position	TP:34	TP:37
Coordinates X		
Coordinates Y		
Description	Red brown Sandy Clay	Olive Clay
Additional Information		
Calcrete / Crushed Stabilizing Agent		

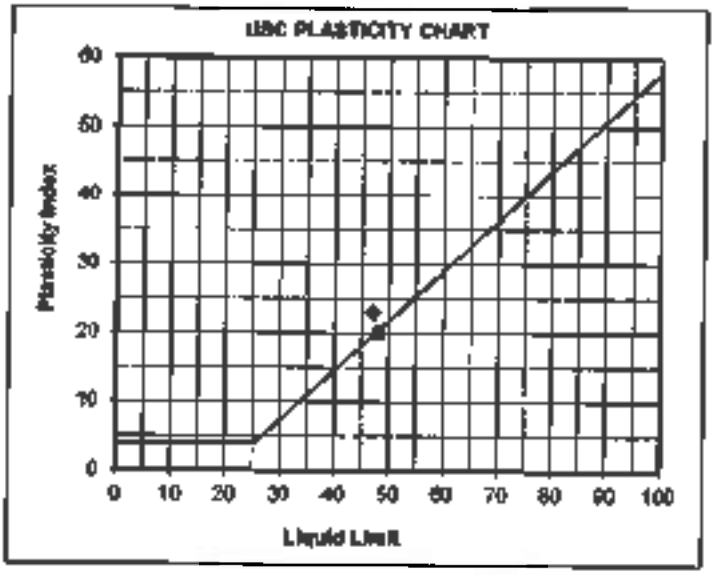


Moisture Content & Relative Density

Moisture Content (%)		
Relative Density (S.G.)		

Sieve Analysis (Wet Prep) SANS 3001-GR3

		9 ◆	10 ■
Percentage Passing	100 mm	100	100
	75 mm	100	100
	63 mm	100	100
	50 mm	100	100
	37.5 mm	100	100
	28 mm	100	100
	20 mm	100	100
	14 mm	100	100
	5 mm	100	99
	2 mm	100	80
	1 mm	100	60
	0.425 mm	99	62
	0.250 mm	96	59
	0.150 mm	94	52
	0.075 mm	79	38
Grading Modulus		0.22	1.19



Hydrometer Analysis* SANS 3001-GR3*

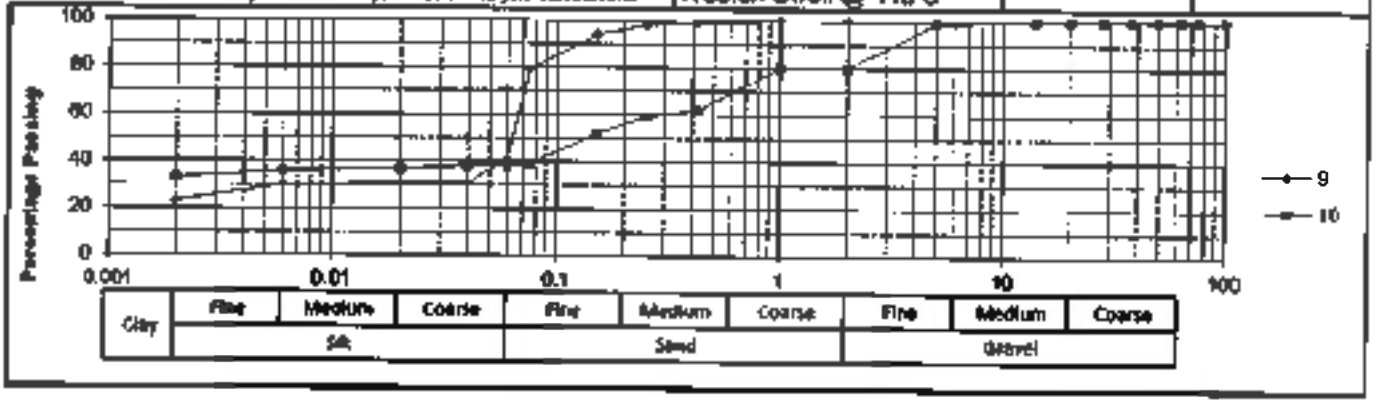
		9 ◆	10 ■
Percentage Passing	0.060 mm	41	38
	0.040 mm	31	38
	0.020 mm	31	37
	0.006 mm	30	36
	0.002 mm	23	33
Gravel	%	0	20
Sand	%	59	42
Silt	%	18	5
Clay	%	23	33

Note: An assumed S.G. may be used in Hydrometer Analysis calculations

Laboratory Number		9 ◆	10 ■
Atterberg Limits -425µ		SANS 3001-GR10	
Liquid Limit	%	47	48
Plasticity Index	%	23	20
Linear Shrinkage	%	11.5	10.0
Overall PI	%		

Classifications

HRB (AASHTO)	A-7-6	A-7-6
Unified (ASTM D2487)	CL	CL
Weston Swell @ 1 kPa		



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Client	:	Delta Geotech (Pty) Ltd	Date Received:	23/06/2019
Project	:	Bloemfontein	Date Reported:	25/09/2019
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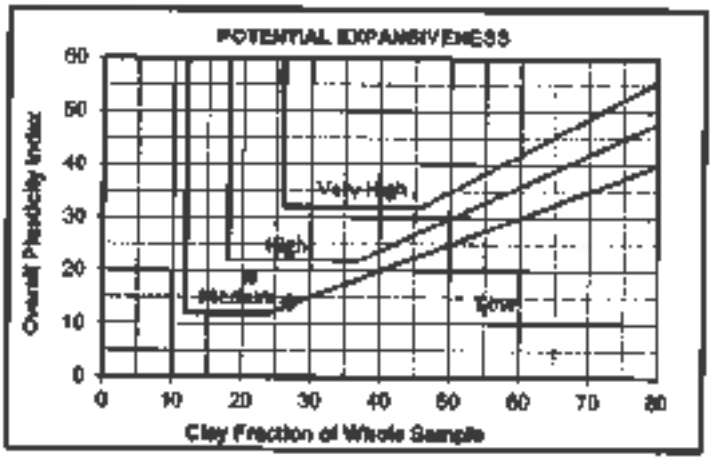
Sampling Method: Samples delivered by client.

Any test results in this report, marked with *, are not included in the schedule of accreditation for this laboratory.

FOUNDATION INDICATOR

Laboratory Number	11 ◆	12 ■
Field Number / Client Reference	E891/11	E891/12
Depth (m)	0.5	0.5
Position	TP:39	TP:42
Coordinates X		
Coordinates Y		
Description	Light grey Sandy Clay	Red brown Sandy Clay
Additional Information		
Calcrete / Crushed Stabilizing Agent		

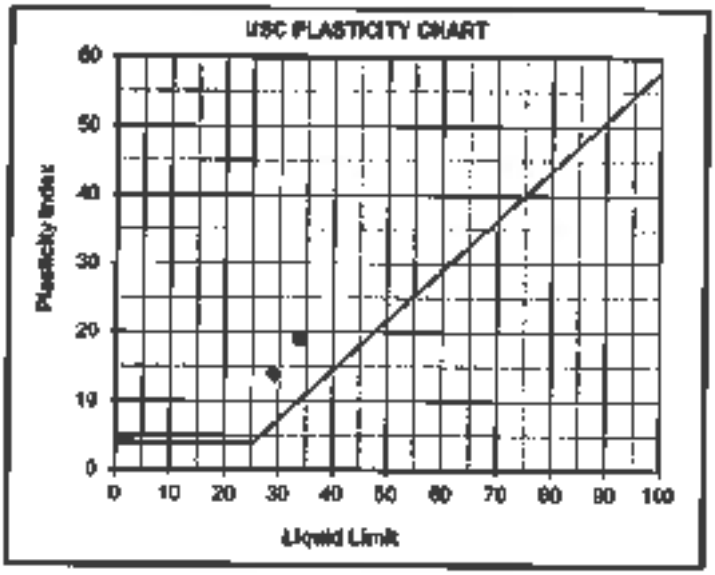


Moisture Content & Relative Density

Moisture Content (%)		
Relative Density (S.G.)		

Sieve Analysis (Wet Prep) SANS 3001-GR1

	11 ◆	12 ■
100 mm	100	100
75 mm	100	100
63 mm	100	100
50 mm	100	100
37.5 mm	100	100
28 mm	100	100
20 mm	100	100
14 mm	100	100
5 mm	100	100
2 mm	98	99
1 mm	98	99
0.425 mm	94	96
0.250 mm	91	96
0.150 mm	80	84
0.075 mm	56	61
Grading Modulus	0.52	0.42

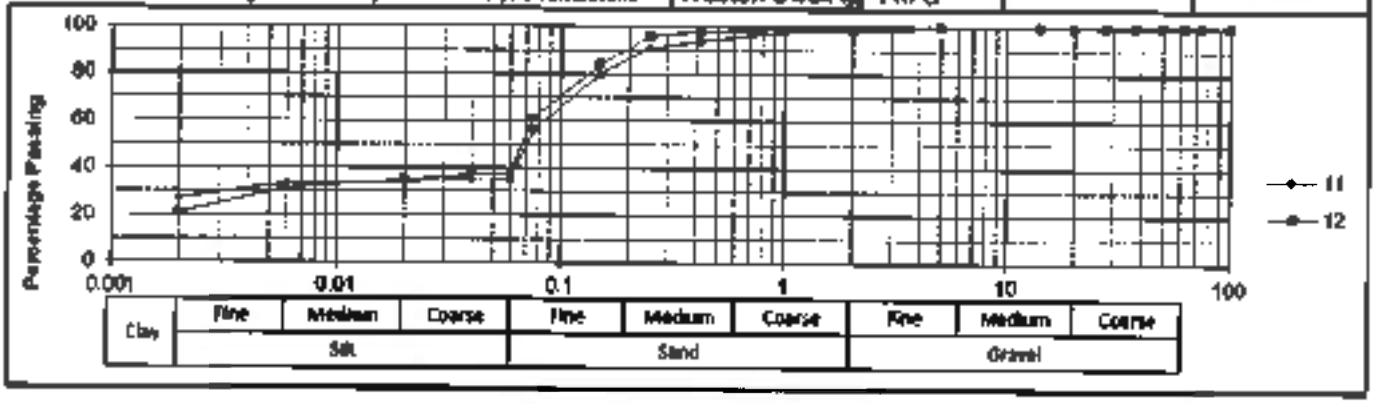


Hydrometer Analysis* SANS 3001-GR3*

	11 ◆	12 ■
0.060 mm	35	36
0.040 mm	35	37
0.020 mm	34	35
0.006 mm	33	31
0.002 mm	27	21
Gravel %	2	1
Sand %	63	61
Silt %	8	17
Clay %	27	21

Note: An assumed S.G. may be used in Hydrometer Analysis calculations

Laboratory Number	11 ◆	12 ■
Atterberg Limits -425µ	SANS 3001-GR10	
Liquid Limit %	29	34
Plasticity Index %	14	19
Linear Shrinkage %	7.0	9.5
Overall PI %		
Classifications		
HRB (AASHTO)	A-6	A-6
Unified (ASTM D2487)	CL	CL
Weston Swell @ 1 kPa		



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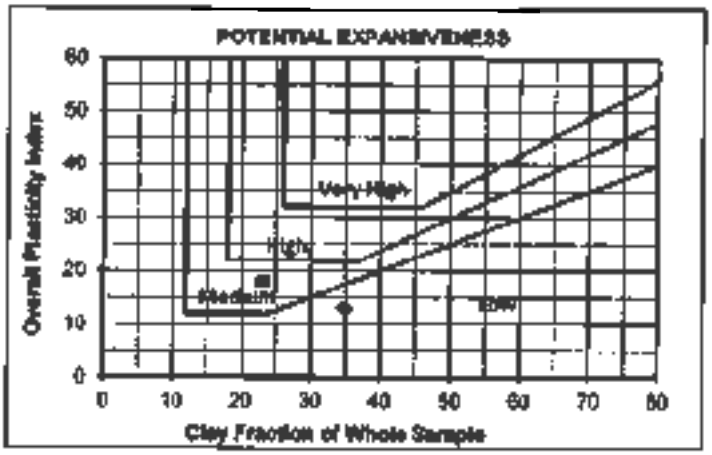
Client	:	Delta Geotech (Pty) Ltd	Date Received:	23/08/2019
Project	:	Bloemfontein	Date Reported:	25/09/2019
Project No	:	2019-E-891	Page No. :	8 of 11

Sampling Method: Samples delivered by client.

Any test results in this report, marked with *, are not included in the schedule of accreditation for this laboratory.

FOUNDATION INDICATOR

Laboratory Number	13 ◆	14 ■
Field Number	E891/13	E891/14
Client Reference		
Depth (m)	0.4	1.4
Position	TP:44	TP:46
Coordinates X		
Coordinates Y		
Description	Grey Clay	Weathered Dolerite
Additional Information		
Calcrete / Crushed Stabilizing Agent		



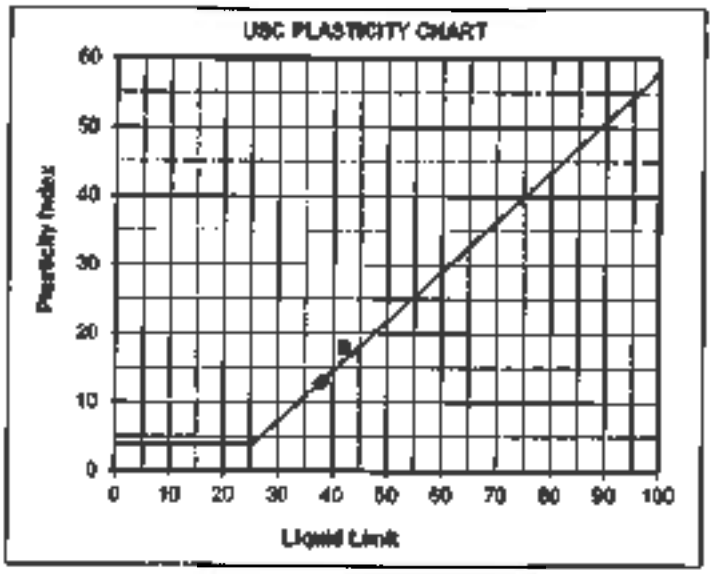
Moisture Content & Relative Density

Moisture Content (%)		
Relative Density (S.G.)		

Sieve Analysis (Wet Prep) — SANS 3001-GR1

	13 ◆	14 ■
100 mm	100	100
75 mm	100	100
63 mm	100	100
50 mm	100	100
37.5 mm	100	100
28 mm	100	100
20 mm	100	100
14 mm	100	100
5 mm	100	98
2 mm	99	96
1 mm	99	96
0.425 mm	98	93
0.250 mm	97	92
0.150 mm	88	91
0.075 mm	67	85
Grading Modulus	0.36	0.26

Percentage Passing



Hydrometer Analysis* — SANS 3001-GR3*

	13 ◆	14 ■
0.060 mm	64	46
0.040 mm	62	44
0.020 mm	60	41
0.006 mm	57	35
0.002 mm	36	23
Gravel %	1	4
Sand %	35	50
Silt %	29	23
Clay %	35	23

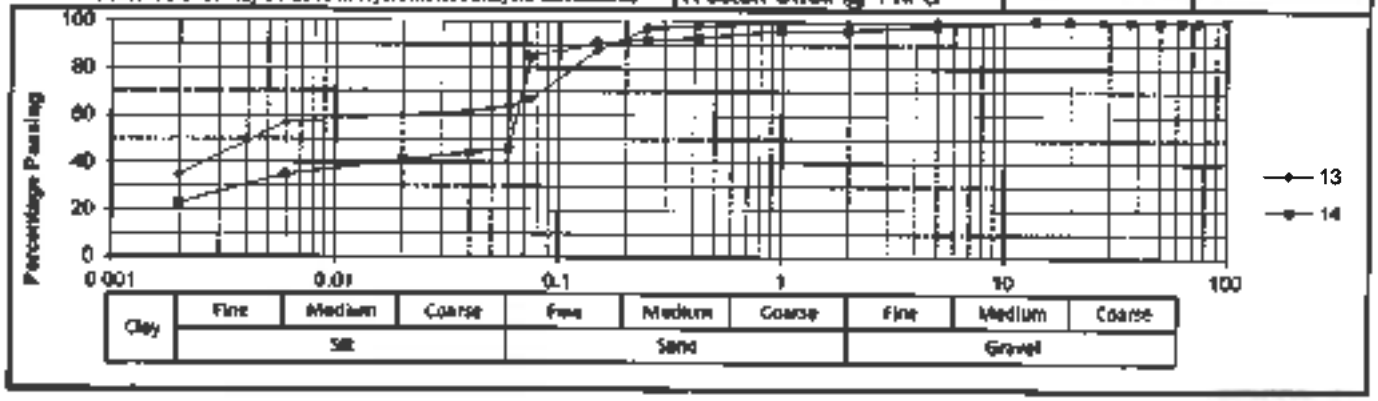
Percentage Passing

Note: An assumed S.G. may be used in Hydrometer Analysis calculations

Laboratory Number	13 ◆	14 ■
Atterberg Limits -425µ	SANS 3001-GR10	
Liquid Limit %	38	42
Plasticity Index %	13	18
Linear Shrinkage %	6.5	9.0
Overall PI %		

Classifications

HRB (AASHTO)	A-7-6	A-7-6
Unified (ASTM D2487)	CL	CL
Weston Swell @ 1 kPa		



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Client	:	Delta Geotech (Pty) Ltd	Date Received:	23/08/2019
Project	:	Bloemfontein	Date Reported:	25/09/2019
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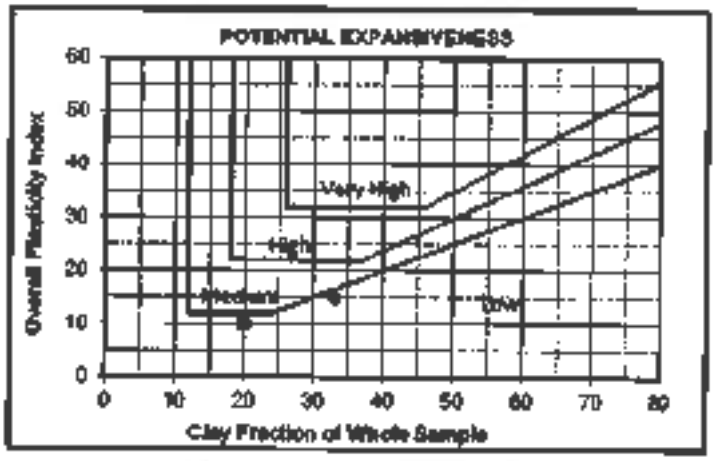
Sampling Method: Samples delivered by client.

Any test results in this report, marked with *, are not included in the schedule of accreditation for this laboratory.

FOUNDATION INDICATOR

Laboratory Number		15 ◆	16 ■
Field Number		E891/15	E891/16
Client Reference			
Depth (m)		-	1.2
Position		TP:48	TP:50
Coordinates	X		
	Y		
Description		Red brown Sandy Clay	Grey brown Clayey Snd
Additional Information			
Calcrete / Crushed Stabilizing Agent			

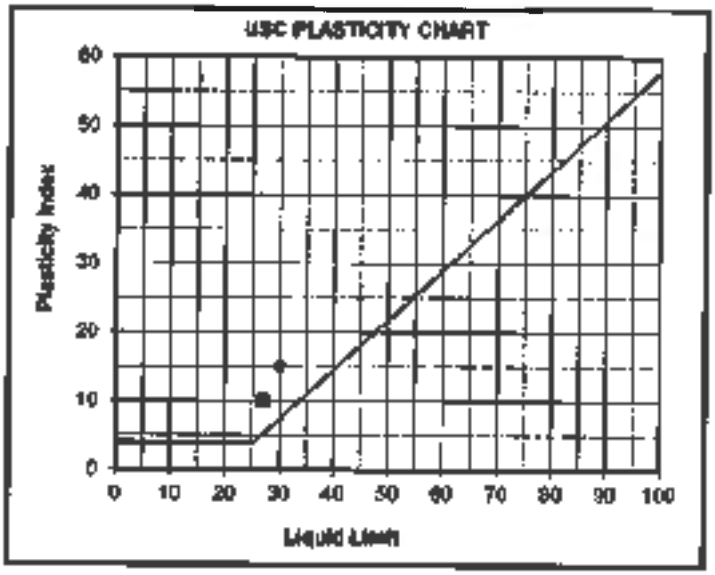


Moisture Content & Relative Density

Moisture Content (%)		
Relative Density (S.G.)		

Sieve Analysis (Wet Prep) SANS 3001-GR1

Percentage Passing	100 mm	100	100
	75 mm	100	100
	63 mm	100	100
	50 mm	100	100
	37.5 mm	100	100
	28 mm	100	100
	20 mm	100	100
	14 mm	100	100
	5 mm	100	100
	2 mm	100	99
	1 mm	100	99
	0.425 mm	99	97
	0.250 mm	98	95
	0.150 mm	88	83
	0.075 mm	68	52
Grading Modulus		0.33	0.52

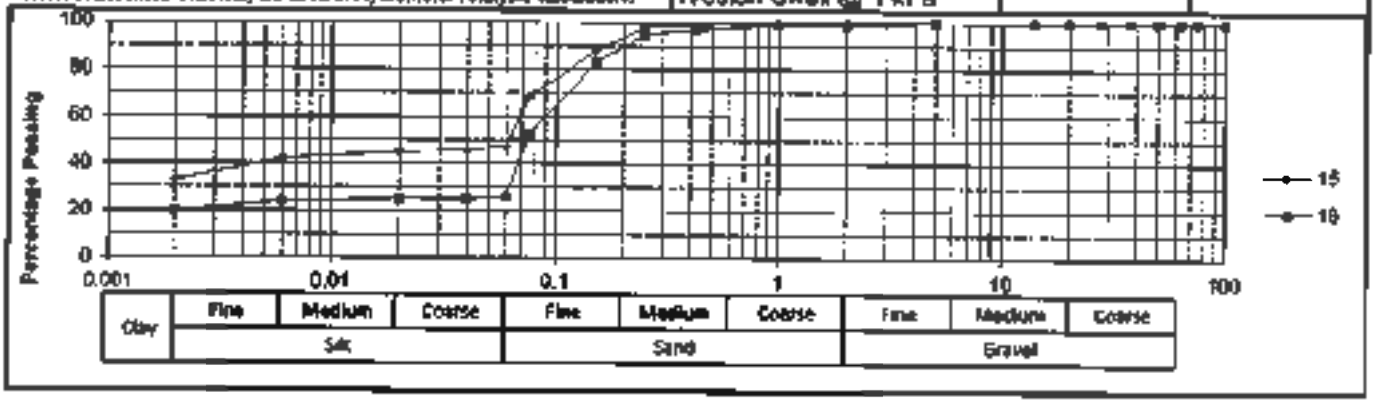


Hydrometer Analysis* SANS 3001-GR3*

Percentage Passing	0.060 mm	47	26
	0.040 mm	46	25
	0.020 mm	45	25
	0.006 mm	42	24
	0.002 mm	33	20
Gravel	%	0	1
Sand	%	53	73
Silt	%	14	6
Clay	%	33	20

Note: An assumed S.G. may be used in Hydrometer Analysis calculations

Laboratory Number		15 ◆	16 ■
Atterberg Limits -#2lb		SANS 3001-GR10	
Liquid Limit	%	30	27
Plasticity Index	%	16	10
Linear Shrinkage	%	7.5	5.0
Overall PI	%		
Classification			
HRB (AASHTO)		A-6	A-4
Unified (ASTM D2487)		CL	CL
Weston Swell @ 1 kPa			



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Client	:	Delta Geotech (Pty) Ltd	Date Received:	23/08/2019
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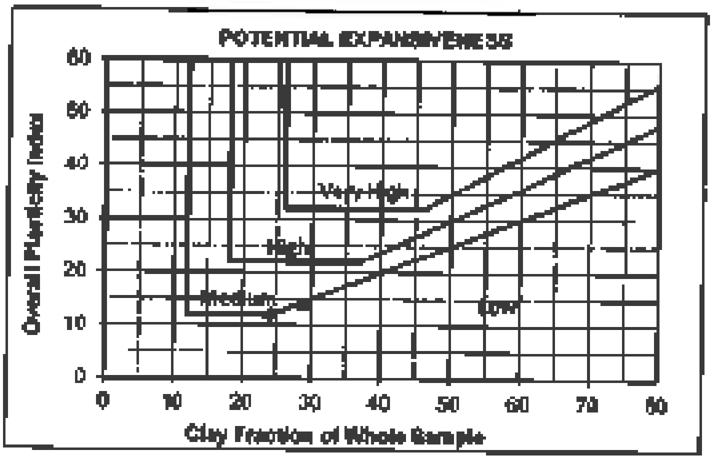
Sampling Method: Samples delivered by client.

Any test results in this report, marked with *, are not included in the schedule of accreditation for this laboratory.

FOUNDATION INDICATOR

Laboratory Number		17 ◆	18 ■
Field Number		E891/17	E891/18
Client Reference			
Depth (m)		1.7	0.2
Position		TP:56	TP:52
Coordinates	X		
	Y		
Description		Olive Sandy Clay	Red brown Sandy Clay
Aditional Information			
Calcrete / Crushed			
Stabilizing Agent			

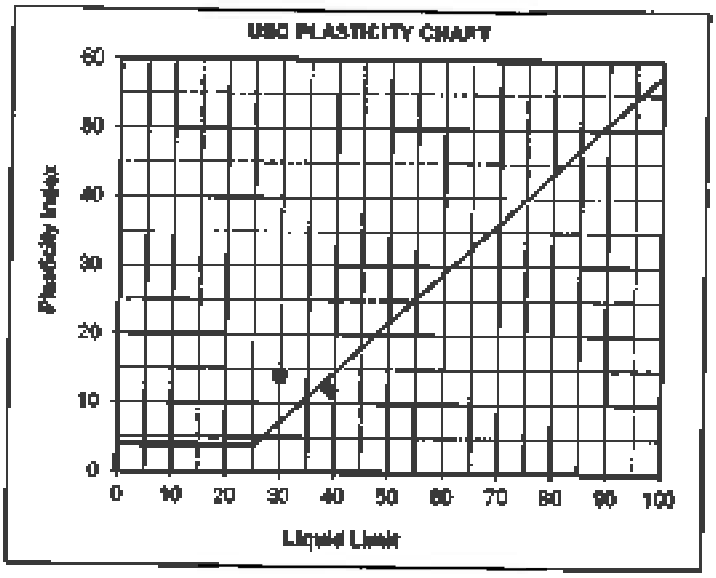


Moisture Content & Relative Density

Moisture Content (%)		
Relative Density (S.G.)		

Sieve Analysis (Wet Prep) SANS 3001-GR1

Percentage Passing	17	18
100 mm	100	100
75 mm	100	100
63 mm	100	100
50 mm	100	100
37.5 mm	100	100
28 mm	100	100
20 mm	100	100
14 mm	100	100
5 mm	100	99
2 mm	100	97
1 mm	100	97
0.425 mm	99	95
0.250 mm	96	92
0.150 mm	88	81
0.075 mm	73	51
Grading Modulus	0.28	0.57



Hydrometer Analysis* SANS 3001-GR3*

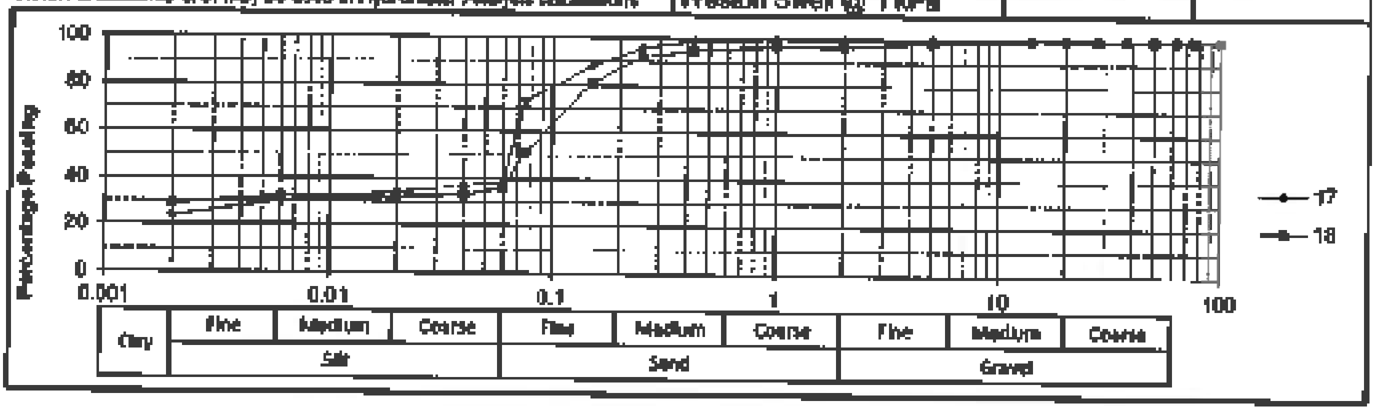
		17	18
Percentage Passing	0.060 mm	38	36
	0.040 mm	37	33
	0.020 mm	34	32
	0.006 mm	30	32
	0.002 mm	24	29
Gravel	%	0	3
Sand	%	62	61
Silt	%	14	7
Clay	%	24	29

Note: An assumed S.G. may be used in Hydrometer Analysis calculations

Laboratory Number		17 ◆	18 ■
Atterberg Limits -425μ		SANS 3001-GR10	
Liquid Limit	%	38	30
Plasticity Index	%	12	14
Linear Shrinkage	%	6.0	7.0
Overall PI	%		

Classifications

HRB (AASHTO)	A-6	A-6
Unified (ASTM D2487)	CL	CL
Weston Swell @ 1 kPa		



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Client	:	Delta Geotech (Pty) Ltd	Date Received:	23/08/2019
Project	:	Bloemfontein	Date Reported:	25/09/2019
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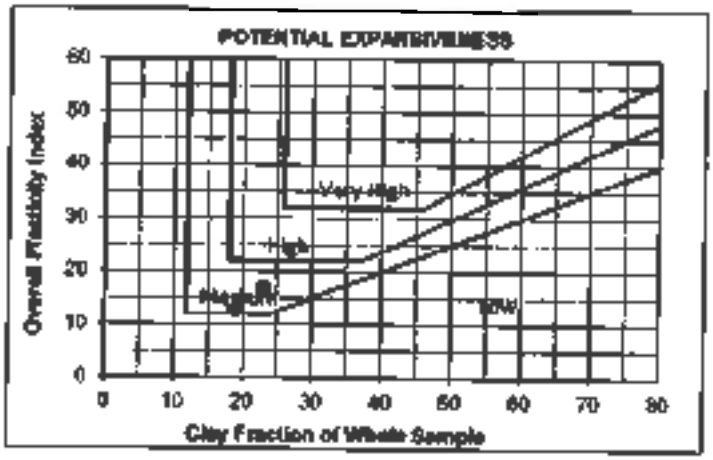
Sampling Method: Samples delivered by client.

Any test results in this report, marked with *, are not included in the schedule of accreditation for this laboratory.

FOUNDATION INDICATOR

Laboratory Number		19 ◆	20 ■
Field Number		E891/19	E891/15
Client Reference			
Depth (m)		0.7	0.5
Position		TP:58	TP:57
Coordinates	X		
	Y		
Description		Olive Sandy Clay	Grey Sandy Clay
Additional Information			
Calcrete / Crushed Stabilizing Agent			

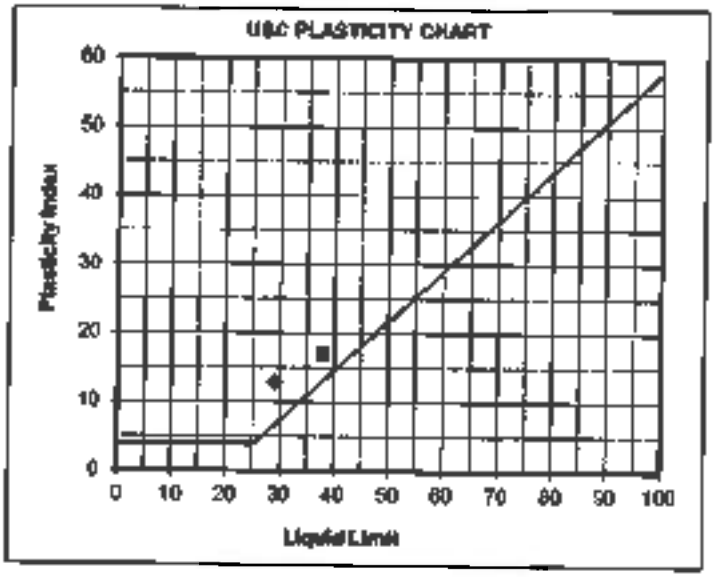


Moisture Content & Relative Density

Moisture Content (%)		
Relative Density (S.G.)		

Sieve Analysis (Wet Prep) — SANS 3001-GR1

		19 ◆	20 ■
Percentage Passing	100 mm	100	100
	75 mm	100	100
	63 mm	100	100
	50 mm	100	100
	37.5 mm	100	100
	28 mm	100	100
	20 mm	100	100
	14 mm	100	100
	5 mm	100	100
	2 mm	99	99
	1 mm	99	99
	0.425 mm	96	98
	0.250 mm	96	96
	0.150 mm	65	85
	0.075 mm	61	61
Grading Modulus		0.42	0.42

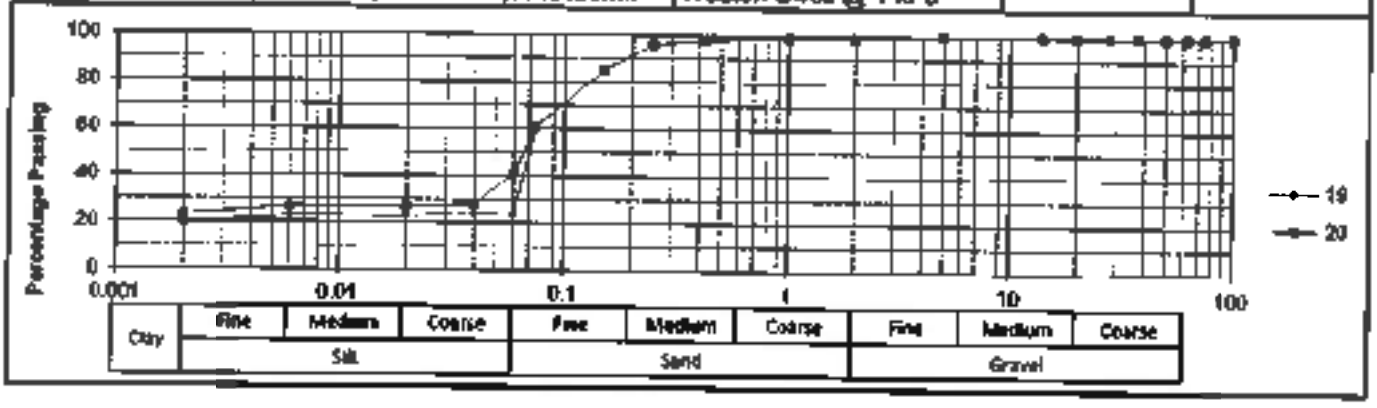


Hydrometer Analysis* — SANS 3001-GR3*

		19 ◆	20 ■
Percentage Passing	0.060 mm	24	41
	0.040 mm	24	28
	0.020 mm	23	27
	0.006 mm	23	27
	0.002 mm	19	23
Gravel	%	1	1
Sand	%	75	58
Silt	%	5	16
Clay	%	19	23

Note: An assumed S.G. may be used in Hydrometer Analysis calculations

Laboratory Number		19 ◆	20 ■
Atterberg Limits -425µ		SANS 3001-GR10	
Liquid Limit	%	29	38
Plasticity Index	%	13	17
Linear Shrinkage	%	6.5	8.5
Overall PI	%		
Classifications			
NRB (AASHTO)		A-6	A-6
Unified (ASTM D2487)		CL	CL
Weston Swell @ 1 kPa			



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CERTIFICATE OF ANALYSES
TCLP / ACID RAIN / DISTILLED WATER EXTRACTIONS

Date received: 2018-09-04 **Date completed: 2019-09-10**
Project number: 1000 **Report number: 86063** **Order number: 16426**

Client name: Labco Southern Africa (Pty) Ltd **Contact person: Natasya van Rooi**
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Analyses	Sample Identification	
	TP:08 @04m	TP:16 @1.9m
Sample number	73820	73821
TCLP / Borax / Distilled Water	Distilled Water	Distilled Water
Mass Used (g)	500	500
Volume Used (mℓ)	1000	1000
Paste pH 1:2	5.2	6.9
Paste Electrical Conductivity in mS/m at 25˚C	17.8	14.6

Analyses	Sample Identification	
	TP:21 @0.1m	TP:30 @0.1m
Sample number	73822	73823
TCLP / Borax / Distilled Water	Distilled Water	Distilled Water
Mass Used (g)	500	500
Volume Used (mℓ)	1000	1000
Paste pH 1:2	8.3	7.1
Paste Electrical Conductivity in mS/m at 25˚C	31.5	18.4

Analyses	Sample Identification	
	TP:34 @0.2m	TP:37 @0.7m
Sample number	73824	73825
TCLP / Borax / Distilled Water	Distilled Water	Distilled Water
Mass Used (g)	500	500
Volume Used (mℓ)	1000	1000
Paste pH 1:2	7.2	6.4
Paste Electrical Conductivity in mS/m at 25˚C	43.2	16.1

S. Laubscher
Assistant Geochemistry Project Manager

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CERTIFICATE OF ANALYSES
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Analyses	Sample Identification	
	TP:42 @0.5m	TP:48 @0.2m
Sample number	73826	73827
TCLP / Borax / Distilled Water	Distilled Water	Distilled Water
Mass Used (g)	500	500
Volume Used (mℓ)	1000	1000
Paste pH 1:2	6.4	8.3
Paste Electrical Conductivity in mS/m at 25˚C	18.2	20.2

Analyses	Sample Identification	
	TP 12 @ 0.2m (E891/12 TP 42 @0.5)	TP 32@ 0.5m (E891/15 0.2 Brown Red Silty Clay)
Sample number	73828	73829
TCLP / Borax / Distilled Water	Distilled Water	Distilled Water
Mass Used (g)	500	500
Volume Used (mℓ)	1000	1000
Paste pH 1:2	5.3	7.0
Paste Electrical Conductivity in mS/m at 25˚C	26.5	23.2

Please note:
- The blank is subtracted from all leach results, except pH and Electrical Conductivity.

S. Laubscher
Assistant Geochemistry Project Manager

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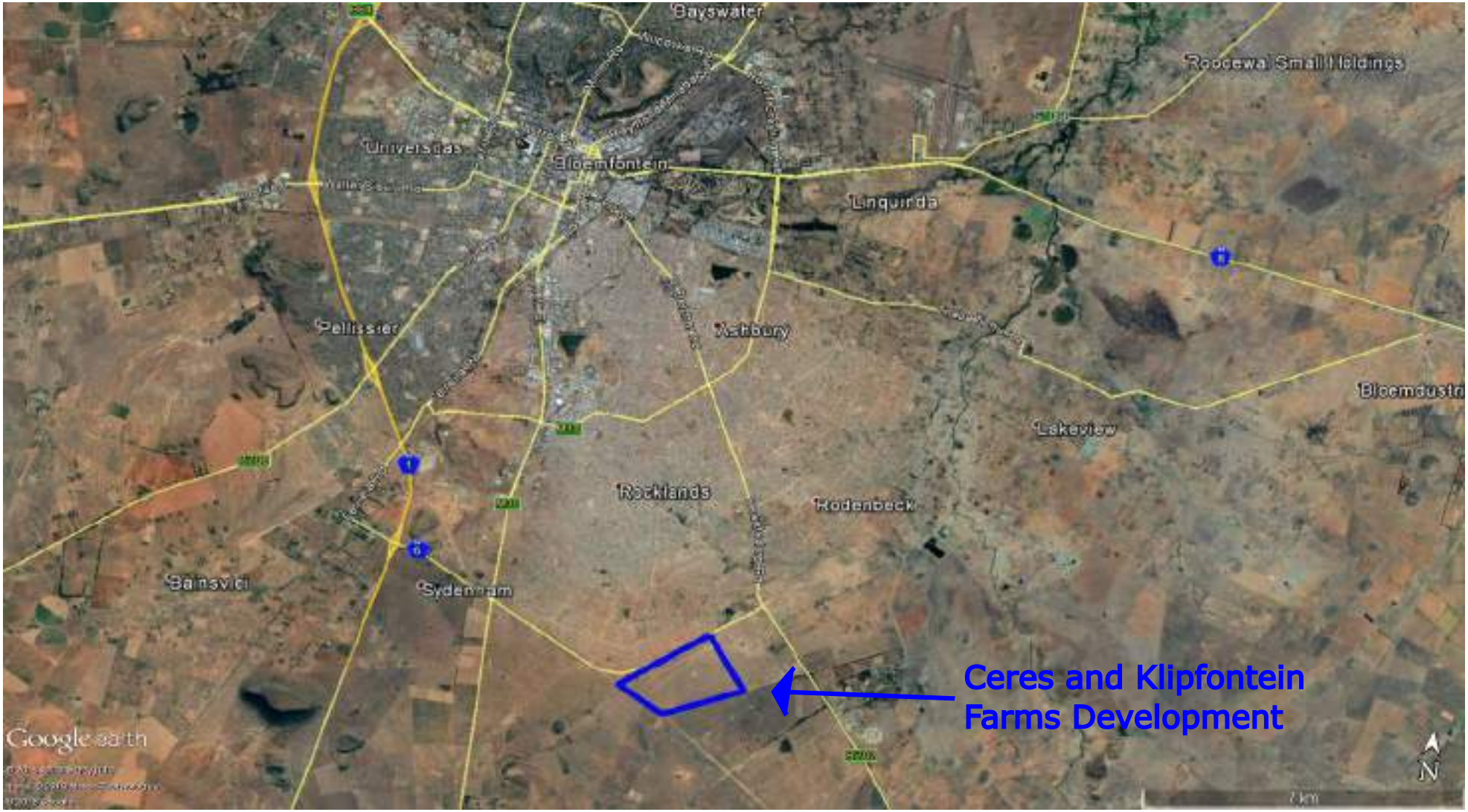
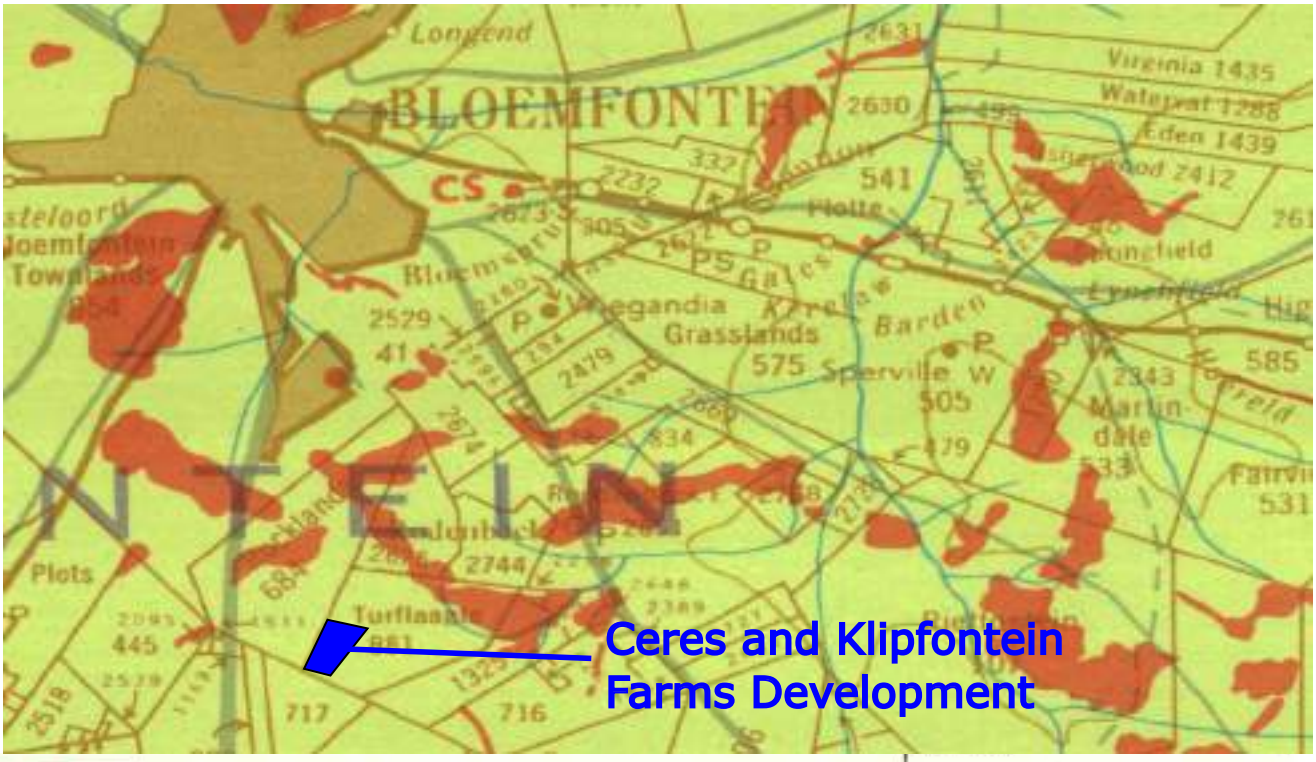


Figure 1 : Locality Plan

DELTA
GEOTECH



	Dolerite, overprinted on geological formations Doleriet, oorgedruk op geologiese formasies		
K4d	Basaltic lava Basaltiese lawa	Drakensberg Stage Etage Drakensberg	Stormberg Series Serie Stormberg
K4c	Massive sandstone, thin shale Massiewe sandsteen, dun skalie	Cave Sandstone Stage Etage Holkranssandsteen	
K4r	Purple shale and mudstone; thin sandstone Pers skalie en moddersteen; dun sandsteen	Red Beds Stage Etage Rooilae	
K4m	Feldspathic sandstone and grit, green shale Veldspatiese sand- en grintsteen, groen skalie	Molteno Stage Etage Molteno	
K3u	Purple and green shale, thick sandstone beds Pers en groen skalie, dik sandsteenlae	Upper Stage Boonste Etage	Beaufort Series Serie Beaufort
K3m	Sandstone, shale and mudstone Sandsteen, skalie en moddersteen	Middle Stage Middelste Etage	
K3l	Sandstone, shale and mudstone Sandsteen, skalie en moddersteen	Lower Stage Onderste Etage	
K2u	Mudstone, shale Moddersteen, skalie	Upper Stage Boonste Etage	Ecca Series Serie Ecca

KARROO SYSTEM
SISTEEM KAROO

Figure 2 : Geological Plan

Not to scale

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Figure 3 : Site Plan - Ceres and Klipfontein Farms Development

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APPENDIX D5: ENGINEERING SERVICES REPORT

CIVILCONSULT
Consulting Engineers

MANGAUNG METROPOLITAN MUNICIPALITY

TOWNSHIP ESTABLISHMENT ON A PORTION OF THE FARM KLIPFONTEIN 716 AND THE FARM CERES 626, BLOEMFONTEIN

SERVICES REPORT

PROJECT NO. 2698

JULY 2020

MANGAUNG METROPOLITAN MUNICIPALITY

TOWNSHIP ESTABLISHMENT ON A PORTION OF THE REMAINDER OF THE FARM KLIPFONTEIN 716 AND FARM CERES 626, BLOEMFONTEIN

SERVICES REPORT

CIVILCONSULT

MANGAUNG METROPOLITAN MUNICIPALITY : TOWNSHIP ESTABLISHMENT ON A PORTION OF THE REMAINDER OF THE FARM KLIPFONTEIN 716 AND FARM CERES 626, BLOEMFONTEIN : SERVICES REPORT

1. CLIENT :

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2. FOR SUBMISSION TO :

Local Authority	Mangaung Metropolitan Municipality (Roads- and Storm Water)
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Tel No. / Cell No.	051-410 6715 / 083 512 0283
E-mail	heinrich.arpin@mangaung.co.za

3. FOR SUBMISSION TO :

Local Authority	Mangaung Metropolitan Municipality (Water and Sanitation)
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4. COMPILED BY :

Consulting Engineers	CIVILCONSULT Projects (Pty) Ltd
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Fax No.	086 583 6249
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MANGAUNG METROPOLITAN MUNICIPALITY : TOWNSHIP ESTABLISHMENT ON A PORTION OF THE REMAINDER OF THE FARM KLIPFONTEIN 716 AND FARM CERES 626, BLOEMFONTEIN : SERVICES REPORT

1. INTRODUCTION

CIVILCONSULT Projects (Pty) Ltd was appointed by NGOTI Development Consultants for the compilation of a Services Report for Engineering Services for the Township Establishment on a Portion of the Remainder of the Farm Klipfontein 716 and Farm Ceres 626, Bloemfontein.

For the purposes of this report, we will refer to the Township Establishment on a Portion of the Remainder of the Farm Klipfontein 716 and Farm Ceres 626, Bloemfontein, as the Proposed Development.

2. PROFESSIONAL TEAM

The professional team is as follows :

Professional Discipline	Name of Entity	Contact Person(s)
Client	NGOTI Development Consultants	Fumani Mathebula
Town Planners	NGOTI Development Consultants	Fumani Mathebula
Geologists	Delta Geotech	Matthew Jones
Land Surveyors	Solly Moropane Professional Land Surveyors	Solly Moropane
Environmentalists	Inaluk Consulting Services	Kutani Nkuna
Traffic Engineers	SMEC	Mark Marais
Electrical Engineers	CIVILCONSULT Projects (Pty) Ltd	Nico van der Merwe / Angelique Scott
Civil Engineers	CIVILCONSULT Projects (Pty) Ltd	Leon Wentzel / Eben Terblanche

3. LOCATION OF THE PROPOSED DEVELOPMENT AND FLOOD LINES

The Proposed Development is located on a Portion of the Remainder of the Farm Klipfontein 716 and Farm Ceres 626, Bloemfontein, Free State Province.

The Proposed Development is bounded by the Provincial Road R702 to the north-west. Portions 2, 4 and 5 of the Farm Klipfontein 716 forms the north-eastern boundary of the Proposed Development. The south-eastern boundary is formed by the Farm Ravenswood 1611 and the south-western boundary is formed by the Remainder of the Farm Klipfontein 716.

A tributary to the Renoosterspruit originates inside the Proposed Development and the flood lines of this watercourse were determined by CIVILCONSULT Projects (Pty) Ltd during August 2019.

The 1:50 and 1:100-year flood lines were taken into account with the finalization of the township layout plan.

Refer to Annexure A Drawing No. 2698/100/01/00 for a Locality Plan.

Refer to Annexure C Drawing No. 2698/120/01/00 for the Flood Lines.

4. LAND USES

The proposed land uses for the Proposed Development are shown in Table 4 below.

Table 4 : Proposed Land Uses

Zoning	Area (ha)	FAR	Coverage (%)	Density (Units / ha)	Number of Erven / Units / Floor Area (m^2)
Residential 1	131.20	-	60%	50 Units / ha	6 560 Erven
Residential 2	4.40	-	60%	75 Units / ha	330 Units
Business 1	3.30	0.70	70%	-	23 100.00
Place of Worship	0.50	0.70	70%	-	3 500.00
Municipal	0.20	0.80	70%	-	1 600.00
Public Open Space	12.60	-	-	-	126 000.00
Streets	53.80	-	-	-	538 000.00
Institutional					
Community Facility	0.30	0.7	70%	-	2 100.00
Health Centre	1.20	0.7	70%	-	8 400.00
Library	0.80	0.7	70%	-	5 600.00
Police Station	1.20	0.7	70%	-	8 400.00
Recreational					
Sports Field	1.90	0.7	70%	-	13 300.00
Educational					
Primary School	4.20	0.7	70%	-	29 400.00
Combined School	7.40	0.7	70%	-	51 800.00
Crèche	0.40	0.7	70%	-	2 800.00

5. GEOTECHNICAL ASPECTS

A Phase 1 Geotechnical Housing Investigation Report for the Proposed Development was compiled by Delta Geotech during October 2019. The following is an extract from this report.

11. RECOMMENDATIONS

With reference to items discussed in the geotechnical evaluation this section provides recommendations for foundations and surface beds, as well as recommendations for excavatability and drainage.

11.1 Foundation Recommendations

The following options listed in Table 5 should be considered.

Table 5 : Foundation Solutions

Site Class Designation	Foundation Solutions
S2/H2/R	*Found structures on colluvial and residual soils or underlying rock* ***Colluvial and Residual soils:*** • *Found on at least medium dense/firm soil using a stiffened or cellular raft with articulation joints or lightly reinforced masonry. An approximate allowable bearing pressure of 80kPa would be achievable* ***Completely weathered soft rock:*** • *Strip or pad footings with normal construction techniques. Approximate allowable bearing pressure of 150kPa* ***At least highly weathered medium hard rock:*** • *Strip or pad footings with normal construction techniques. Approximate allowable bearing pressure of 300kPa. In areas where rock occurs deeper than 1.10m begl consider pad footings, piers and ground beams or excavating to moderately weathered rock and backfilling with cement stabilized geotechnically inert material*

Due to slight soil acidity and alkalinity precautions to safeguard against concrete degradation should be considered. Increasing the thickness of the concrete to provide a "buffer" or, if reinforcing degradation is of concern, then consider using glass fibre reinforcing instead of steel. Glass fibre also has the benefit of being lighter which can reduce associated haulage costs.

11.2 Pavements and Surface Beds

In areas where the structures are founded over rock the following options should be considered :

1) Soils underlying the surface beds should be excavated and spoiled. This followed by introduction of geotechnically inert material from borrow, compacted in layers, to form the surface bed subgrade.

2) Alternatively, consider suspended or "floating" floor slabs.

11.3 Excavatability

Excavation in the colluvial and residual soils, as well as completely weathered rock, classifies as "Soft" excavation in terms of the SANS 1200DM Earthworks Specification. Soils can be excavated using hand picks and spades or backhoes.

Excavation in highly weathered medium hard rock would be classified as "Intermediate" excavation and could be excavated by back-acting excavator having a fly wheel power >0.1kW for each mm of lined-bucket width or with the use of pneumatic tools before removal by a machine capable of removing soft material.

Deeper excavations for services into "hard" rock will likely require the use of pneumatic tools and blasting in the less weathered hard rock.

11.4 Slope Stability and Erosion

Due to the granular nature of the colluvium erosion could occur. Erosion would be minor due to fairly flat site gradient where vegetating the soils at surface and adequate surface water management should help in this regard.

The natural slopes in the area are relatively stable under present conditions. Excavations in unconsolidated soils deeper than 1.5m for service trenches will require shoring or battered slopes for safety reasons.

11.5 Drainage

In general attention to drainage and the effective collection and disposal of storm water run-off is required throughout the site as part of general surface water management.

Measures to prevent water ingress into soils below and against foundations will be required. These would include, grading of slopes to promote run-off and to prevent ponding close to the buildings, effective collection and removal of storm water, and water from downpipes, as well as regular checking of wet services for leaks.

12. CONCLUSIONS

In summary, the site is suitable for the developments envisaged provided that all structures are designed accordingly.

The ground conditions described in this report refer specifically to point sources encountered in test pits and DPL's. It is therefore possible, or probable, that conditions at variance with those discussed may be encountered. Important then is that Delta Geotech (Pty) Ltd carry out periodic inspections during construction, before in-situ subgrade treatment is carried out. Any change from the anticipated ground conditions could then be taken into account to avoid unnecessary expense. In this regard, it is important that the construction phase of the project be treated as an augmentation of the geotechnical investigation. This additional work can be conducted on a time and cost basis.

A copy of the Phase 1 Geotechnical Housing Investigation Report will be made available upon request.

6. TRAFFIC IMPACT ASSESSMENT

A Traffic Impact Assessment was conducted for the Proposed Development by SMEC South Africa (Pty) Ltd during June 2020.

The following is an direct extract from this report.

9. Conclusions and Recommendations

The analysis of the development was done in two sections: The internal network and the accesses and secondly the effect the development has on the wider southern Mangaung road network.

9.1 Access and Internal Road Network

The accesses and internal road network was assessed based on the road hierarchy, capacity, NMT and public transport requirements.

Accesses:

There are three access proposed as well as the improvements to the Dewetsdorp Road intersection. The accesses are located on the proposed arterial and two proposed collectors. The access on the proposed arterial is to be a signalised intersection, while the arterial itself is proposed to be a dual carriageway. The accesses on the collectors are sufficient as stop streets as per the layouts shown in Chapter 5. The Dewetsdorp Road/Old Ring Road requires an additional 120m auxiliary lane and an additional 60m right turn lane. It is recommended that these improvements are made.

Internal Intersections:

There are nine major internal intersections. Three on the arterial, thee on the western collector and three on the eastern collector. All three of the intersections along the proposed single carriageway collectors are sufficient as stop streets with the proposed layouts as per Chapter 6, while two of the intersections along the dual carriageway arterial are also sufficient as stop streets. However, intersection 2 along the arterial is proposed as a signalised intersection. This intersection is also the main access to the proposed combined school and as such formal NMT must be combined with the signalised intersection.

NMT:

It is proposed that the pedestrian walkways be provided, on both sides of the roadway, in the design of the Klipfontein Development collectors considering the pedestrians that will be utilising the public transport facilities. It is furthermore recommended that pedestrian walkways be provided on both sides of the roadways along the proposed minor arterial and along the old section of the ring road. The walkways proposed for the local roads are required to promote NMT, as well as to allow for an improved connectivity. The proposed NMT allows for safe movement of pedestrians within Klipfontein on the higher order roads, as well as allows for NMT to business, schools, churches and other community facilities such as clinics. It is recommended that the proposed NMT as per Chapter 6 be designed and implemented.

Public Transport:

Public transport layby are required along the collectors and arterials within the development. In addition, the three schools also require laybys.

Collector & Arterial Roads

- *The approximate road length being 1km, 2 lay-by facilities can be accommodated along the road. The facilities should be located at the main arterial access, and at two of the major intersections along both the collectors and the arterial as indicated in Chapter 6*
- *With facilities on both sides of the road, the distance between them is not more than 600m*

School Facilities

- *The development houses 3 educational facilities that would require a lay-by facility in the vicinity of each*
- *Shown in Chapter 6, the collection and drop-off facilities play a significant role in maintaining a safe environment for learners*

It is recommended that the PT facilities be designed as per the locations indicated in Chapter 6.

9.2 External Road Network

The external road network is significantly affected by many latent developments trips that have an effect through the southern area of Mangaung. As a result, the required improvements needs to achieved an acceptable network excluding the Klipfontein Development was highlighted in Chapter 5 and 7 and is recommended that those improvements are still implemented throughout the network.

Yet, the major roads and intersections that were identified to be directly affected by the proposed Klipfontein development are :

- *Dewetsdorp Road*
  - *R702 / Old Ring Road*
- *Singonzo Street*
  - *Singonzo Street / M10*
  - *Singonzo Street / Taelo Molosioa Street*
- *Taelo Molosioa Street*
  - *Taelo Molosioa Street / OR Tambo Road*
- *OR Tambo Road*
  - *OR Tambo Road / M10*
  - *OR Tambo Road / Gutsche Street*
  - *OR Tambo Road / Dewaal Road*
  - *OR Tambo Road / Hartley Street*
  - *OR Tambo Road / Voortrekker Street*
  - *OR Tambo Road / Harvey Street*
- *Dr Belcher Road*
  - *Dr Belcher Road / Anna Maggerman Crescent*
  - *Dr Belcher Road / Heatherdale Road*
  - *Dr Belcher Road / M10*
  - *Dr Belcher Road / Monapi Street*

- *M10*

  - *M10 / Singonzo Street*
  - *M10 / Moshoeshoe Street*
  - *M10 / OR Tambo Road*

As could be seen from the results of the SATURN and SIDRA analysis, the additional improvements required for the above intersections to accommodate the proposed developments trips and latent rights trips are discussed in Chapter 5 and 7. It is recommended that the intersections be improved to accommodate the generated traffic from the Klipfontein Development through into the existing road network as per the phased implementation approach of the latent right developments from between 2022 and 2032.

A copy of the Traffic Impact Assessment Report will be made available upon request.

7. CIVIL ENGINEERING SERVICES

7.1 Design Standards

The design standards to be followed for the design of the civil engineering services are in accordance with the standards specified in the "Guidelines for Human Settlement Planning and Design" (Red Book).

The Design Guidelines for Water Reticulation and Supply and the Design Guidelines for Sewer Mains and Sewer Drainage Systems of the City of Tshwane were used where information could not be gained from the "Guidelines for Human Settlement Planning and Design" (Red Book).

The design standards to be followed for the design of the Roads and Storm Water Services are in accordance with the MMM Design Standards: Roads & Storm Water July 2015.

7.2 Design Software

Civil engineering services will be designed using TechnoCad design programs.

7.3 Ownership of Services

The external and internal services will be taken over by Mangaung Metropolitan Municipality (MMM) who will be responsible for the maintenance of these services.

8. WATER

8.1 Bulk Services

8.1.1 Existing Water Infrastructure

An existing 1050mm Ø Welbedacht water pipe is located parallel to and inside the south-western boundary of the Proposed Development, south-west of the Proposed Development.

An existing 610mm Ø water pipe is located within an existing road reserve approximately 571m from the north-western boundary of the Proposed Development.

Refer to Annexure C Drawing No. 2698/200/01/00 to 2698/200/05/00 for details.

8.1.2 Proposed Bulk Water Infrastructure

Discussions were held between Kopano Moshanyana First Engineer for Water and Sanitation from the Mangaung Metropolitan Municipality (MMM), Christo Potgieter Civil Engineer from Bigen Africa and CIVILCONSULT with regard to the external bulk water upgrades required to accommodate the Proposed Development.

There are three (3) options that could be implemented.

Option 1: The construction of a new 45 Mℓ reservoir close to the Longridge Reservoir.

Kopano Moshanyana indicated in an e-mail dated 11 June 2020 that there are serious storage capacity issues and that the current water infrastructure does not have sufficient storage for the current water demand of the Mangaung Metropolitan Municipality (MMM).

To address the insufficient storage capacity problem in line with the Mangaung Metropolitan Municipality (MMM) Water Master Plan the most feasible option would be to construct a new reservoir (45 Mℓ) close to the Longridge Reservoirs. This option would solve the current and future water problems of the southern side of the Mangaung Metropolitan Municipality (MMM) based on the current SDF.

Option 2: The construction of a temporary ground level reservoir and elevated storage reservoir for the Proposed Development.

To provide the Proposed Development with water and sufficient pressure a new 1 Mℓ elevated storage reservoir will be constructed in the south-western corner of the Proposed Development.

A proposed 6 Mℓ ground level reservoir will connect directly to the existing 1050mm Ø Welbedacht Pipeline and connect to the proposed 1 Mℓ elevated reservoir with a proposed water pump station.

The proposed elevated 1 Mℓ reservoir will be constructed to supply the minimum pressure to the Proposed Development.

CIVILCONSULT proposes that Option 2 be implemented, and costing of Option 2 is included in Paragraph 15.

Option 3: Construction of a new 400 Mℓ reservoir approximately 7.3km south of the Proposed Development.

To supply the area west of the National Road N6 and south of the Provincial Road R702 a new 400 Mℓ reservoir is proposed.

During a Zoom meeting on 22 May 2020 Christo Potgieter from Bigen Africa indicated that the current growth rate of the Mangaung Metropolitan Municipality (MMM) is estimated to be between 1.5% and 3% per year.

Based on the current growth rate the Mangaung Metropolitan Municipality (MMM) will only achieve the current SDF in the next 35-50 years.

The cost of constructing this proposed reservoir is therefore not feasible.

Servitudes will have to be registered in favour of the Mangaung Metropolitan Municipality (MMM) for proposed water pipelines outside of road reserves.

Refer to Annexure C Drawing No. 2698/200/01/00 to 2698/200/05/00 for details.

Refer to Annexure C Drawing No. 2698/200/06/00 BULK and 2698/200/07/00 BULK for details.

Refer to Annexure D for Relevant Correspondence from the Mangaung Metropolitan Municipality (MMM) Water and Sanitation Department.

8.1.3 Proposed Internal Water Reticulation

The internal water reticulation of the Proposed Development will connect directly to the new external water infrastructure, as described in Paragraphs 8.1.1 and 8.1.2 above.

The following elements will have to be included as part of the internal water reticulation :

- uPVC water pipes
- water meters
- isolating valves (RSV or similar)
- fire hydrants
- pressure-reducing valves (if required)
- erf connections (40mm branching to 2 x 25mm diameter, HDPE PE100 PN12.5 pipes for Residential 1 and Residential 2 erven and 75mm to 110mm diameter for all other erven)

The relevant wayleave processes (Provincial or Municipal) will have to be followed for work done within road reserves.

Refer to Annexure C Drawing No. 2698/200/01/00 to 2698/200/05/00 for details.

6.2 Internal Reticulation

6.2.1 Water Design Criteria

The design criteria to be used to analyse and design the water network is indicated in Table 6.2.1 below.

Table 6.2.1 : Water Design Criteria

Item No.	Design Element	Criteria
1.	Average Annual Daily Demand (AADD) for residential and recreational sites	Refer to Table 6.2.2 below
2.	Gross Average Annual Daily Demand (GAADD)	Allow 10% losses
3.	Daily Peak Factor (DPF) (Red Book Standards)	1.80
4.	Peak Hourly Factor (PHF) (Red Book Standards)	3.40
5.	Design Peak Flow Rate (DPFR) for domestic flows	GAADD x PHF
6.	Maximum static head	90m
7.	Minimum residual head under peak demand conditions	20m
8.	Maximum linear flow velocity under peak demand conditions	1.8m/s
9.	Pipe type	uPVC
10.	Minimum pipe class	Class 12
11.	Fire flow at any one hydrant under peak demand condition	25l/s
12.	Minimum pressure at any one hydrant under peak demand conditions	10m
13.	Minimum pressure in the rest of the system under fire flow conditions	5m
14.	Maximum linear flow velocity under fire-fighting conditions	2.2m/s
15.	Boundary roughness (K-Value)	0.1mm
16.	Available static head	To be confirmed
17.	Available dynamic head under fire flow conditions	To be confirmed
18.	Flow formulae	D'Arcy Weissbach
19.	Minimum pipe diameter	75mm

8.2.2 Estimated Water Demand

The estimated water demand for the Proposed Development is shown in Table 8.2.2 below.

Table 8.2.2 : Estimated Water Demand

Zoning	Proposed Development		
	No. of Erven / No. of Units / Floor Area / Size (ha)	Average Annual Daily Demand (AADD)	Water Demand (kl/d)
Residential 1 (50 units/ha)	6 560.00 Erven	0.8kl/d/unit	5 248.00
Residential 2 (75 units/ha)	330.00 Units	0.8kl/d/unit	264.00
Business 1	23 100.00m²	0.4kl/d/100m²	92.40
Place of Worship	3 500.00m²	0.4kl/d/100m²	14.00
Municipal	1 600.00m²	0.4kl/d/100m²	6.40
Community Facility	2 100.00m²	0.4kl/d/100m²	8.40
Health Centre	8 400.00m²	0.5kl/d/100m²	42.00
Library	5 600.00m²	0.4kl/d/100m²	22.40
Police Station	8 400.00m²	0.4kl/d/100m²	33.60
Primary School	4.20ha	12.50kl/d/ha	52.50
Combined School	7.40ha	12.50kl/d/ha	92.50
Crèche	0.40ha	12.50kl/d/ha	5.00
Sports Field	1.90ha	15.00kl/d/ha	28.50
Public Open Space	12.60ha	12.00kl/d/ha	151.20
Streets	53.80ha	-	-
Total			**6 060.90**

9. SANITATION

9.1 Bulk Services

9.1.1 General

The general drainage pattern of the Proposed Development is from south-west to north-east.

9.1.2 Existing Sewer Infrastructure

There is no municipal sewer infrastructure in the vicinity of the Proposed Development.

Refer to Annexure C, Drawing No. 2698/300/01/00 to 2698/300/05/00 for details.

9.1.3 Proposed External Sewer Infrastructure

Kopano Moshanyana First Engineer for Water and Sanitation from the Mangaung Metropolitan Municipality (MMM) provided the proposed bulk sewer infrastructure route in an e-mail dated 14 May 2020 to CIVILCONSULT.

The proposed bulk outfall sewer will be constructed from the eastern boundary of the Proposed Development and will drain to the existing Sterkwater Waste Water Treatment Works (WWTW) to the east of the Proposed Development.

In an e-mail dated 11 June 2020 Kopano Moshanyana indicated that the existing Sterkwater Waste Water Treatment Works (WWTW) has sufficient capacity to accommodate the Proposed Development but the proposed bulk outfall sewer should be upgraded.

It is proposed that the bulk outfall sewer be upgraded to a new 250mm Ø, 525mm Ø and 825mm Ø pipeline along the proposed route to allow future developments to drain to this pipeline.

Servitudes will have to be registered in favour of the Mangaung Metropolitan Municipality (MMM) for proposed sewer outside of road reserves.

Refer to Annexure C, Drawing No. 2698/300/01/00 to 2698/300/05/00 for details.

Refer to Annexure D for Relevant Correspondence from the Mangaung Metropolitan Municipality (MMM) Water and Sanitation Department.

9.1.4 Proposed Internal Sewer Infrastructure

9.1.4.1 General

House connections will be provided for residential erven and bulk sewer connections will be provided for non-residential erven.

Refer to Annexure D for Relevant Correspondence from the Mangaung Metropolitan Municipality (MMM) Water and Sanitation Department.

9.2 Internal Sewer Reticulation

9.2.1 Sewer Design Criteria

The design criteria to be used to design the sewage network is listed in Table 9.2.1 below.

Table 9.2.1 : Sewer Design Criteria

Item No.	Design Element	Criteria
1.	Average Annual Daily flow for special and residential Erven	Refer to Table 9.2.2 below
2.	Peak Factor	2,6
3.	Allowance for infiltration	15%
4.	Capacity of Sewer	Pipes will be designed to run at 70% full, measured in terms of flow depth, at total design flow
5.	Sewer pipe type	PVC-U Class 400, complying with SANS 1601
6.	Minimum velocity	0,7m/s at full flow
7.	Minimum pipe diameter	160mm
8.	Minimum depth of cover to the outside of the pipe barrel for sewers	0.6m (In Servitudes) 1.4m (In Sidewalks, below final kerb level) 1.4m (In Road Carriageways below final constructed road level)

9.2.2 Estimated Sewerage Flow

The estimated sewerage flow for the Proposed Development is shown in Table 9.2.2 below.

Table 9.2.2 : Estimated Sewerage Flow

Zoning	Proposed Development		
	No. of Erven / No. of Units / Floor Area / Size (ha)	Average Annual Daily Flow (AADF)	Sewerage Flow (kℓ/d)
Residential 1 (60 units/ha)	6 560.00 Erven	0.6kℓ/d/unit	3 936.00
Residential 2 (75 units/ha)	330.00 Units	0.6kℓ/d/unit	198.00
Business 1	23 100.00m²	0.32kℓ/d/100m²	73.92
Place of Worship	3 500.00m²	0.32kℓ/d/100m²	11.20
Municipal	1 600.00m²	0.32kℓ/d/100m²	5.12
Community Facility	2 100.00m²	0.32kℓ/d/100m²	6.72
Health Centre	8 400.00m²	0.40kℓ/d/100m²	33.60
Library	5 600.00m²	0.32kℓ/d/100m²	17.92
Police Station	8 400.00m²	0.32kℓ/d/100m²	25.20
Primary School	4.20ha	8.13kℓ/d/ha	34.15
Combined School	7.40ha	8.13kℓ/d/ha	60.16
Crèche	0.40ha	8.13kℓ/d/ha	3.25
Sports Field	1.90ha	6.00kℓ/d/ha	11.40
Public Open Space	12.60ha	-	-
Streets	53.80ha	-	-
Total			**4 416.64**

10. STORM WATER DRAINAGE

10.1 Storm Water Systems

10.1.1 Existing Storm Water Infrastructure

No formal municipal storm water services are available in the vicinity of the Proposed Development.

Heinrich Arpen indicated in an e-mail dated 23 July 2019 that the current Storm Water Master Plan of the Mangaung Metropolitan Municipality (MMM) does not include the Proposed Development, however, the site of the Proposed Development is included in the SDF (Spatial Development Framework) of the MMM. The Storm Water Masterplan will have to be updated to include the Proposed Development.

Refer to Annexure E for Relevant Correspondence from the Mangaung Metropolitan Municipality (MMM) Roads and Storm Water Department.

10.1.2 Proposed Storm Water Infrastructure

The general drainage pattern of the Proposed Development is from south-west to north-east.

The Proposed Development will increase the area of impervious surfaces within the storm water catchment area, causing changes in the quantity of storm water run-off. This will increase the risk of erosion, localised flooding, watercourse turbidity and sedimentation.

Storm water run-off generated by the Proposed Development will be accommodated utilizing storm water pipes and road surface drainage. Storm water run-off will be collected with kerb- and grid inlets located at low points within the Proposed Development.

The storm water pipes will discharge the storm water run-off into a proposed storm water channel located inside the Proposed Development. This proposed storm water channel will discharge the storm water on Portion 4 of the Farm Klipfontein 716.

Refer to Annexure C, Drawing No. 2698/500/01/00 to 2698/500/05/00 for details.

To ensure that storm water run-off from the Proposed Development is properly managed, the following must be exercised :

- avoid or minimise the risk of erosion caused by storm water run-off from new impervious surfaces
- prevent sedimentation and turbidity of watercourses
- ensure that post-development storm water infiltration and run-off rates have no more of an off-site impact than pre-development rates
- minimise the risk of localised flooding caused by increased storm water run-off from impervious surfaces

The storm water system will be designed for a 1:20 year flood return period and a run-off coefficient of 80% (C= 0.8) will be allowed for the Proposed Development.

The storm water outlet structures will be equipped with energy dissipaters to minimize the possibility of erosion at the point of discharge.

Servitudes will have to be registered in favour of the Mangaung Metropolitan Municipality (MMM) for proposed storm water pipes outside of road reserves.

The relevant wayleave processes (Provincial or Municipal) will have to be followed for work done within road reserves.

10.2 Hydrology

Hydrological data to be used in the design of the storm water drainage system for the Proposed Development is summarised in Table 10.2 below.

Table 10.2 : Hydrology

Hydrological Data	
a) Run-off Area	Total Proposed Development Area
b) Flood Return Period	1:25 years for internal storm water pipe systems and road systems
	1:25 years for external storm water pipe systems and road systems
c) Design Method	Rational method for smaller catchment areas

10.3 Design Standards

Table 10.3 lists the standards to be used in the design of the storm water drainage system.

Table 10.3 : Storm Water Design Standards

Design Element	Specification
a) Minimum pipe size	450mm diameter
b) Pipe Type	Interlocking Joint Pipes Pipe Class : 50D, 100D for road crossings
c) Minimum pipe gradient	0,67%
d) Storm water details	According to : The Red Book ("Guidelines for the Provision of Engineering Services and Amenities in Township Development") and MMM Design Standards: Roads & Storm Water July 2015

10.4 Run-off

The pre- and post-development storm water run-off for the Proposed Development are shown in Table 10.4 below.

Refer to Annexure F for the storm water run-off calculations.

Table 10.4 : Storm Water Run-off

Flood Return Period (Years)	Pre-Development Factor	Pre-Development run-off (m^3/s)	Post-Development Factor	Post-Development run-off (m^3/s)
1:2	0.187	3.243	0.800	9.219
1:5	0.205	4.818	0.800	12.459
1:20	0.250	7.990	0.800	16.944

11. ROADS

11.1 Access to the Proposed Development and Internal Roads

A Traffic Impact Assessment was conducted for the Proposed Development by SMEC South Africa (Pty) Ltd during June 2020.

The conclusions and recommendations of the Traffic Impact Assessment will be implemented for the Proposed Development.

Access to the Proposed Development will be gained from Provincial Road R702 at three (3) proposed locations along the north-western boundary of the Proposed Development.

The internal roads will be designed and constructed according to the Standards and Specifications listed in the Red Book (Guidelines for the Provision of Engineering Services and Amenities in Township Development) and the Mangaung Metropolitan Municipality (MMM).

External roads will be designed and constructed according to the relevant Standards and Specifications of the Free State Roads Department or the Red Book (Guidelines for the Provision of Engineering Services and Amenities in Township Development).

The internal and external roads will consists of Class 3 and Class 5 roads. The general road classification is listed in Paragraph 11.2 below.

Refer to Annexure C, Drawing No. 2698/400/01/00 to 2698/400/05/00 for details.

Refer to Annexure E for Relevant Correspondence from the Mangaung Metropolitan Municipality (MMM) Roads and Storm Water Department.

11.2 Classification of Roads

The classification of roads are shown in Table 11.2 below.

Table 11.2 : Classification of Roads

Class No.	Function
3	District Distributor
5	Major Residential Access Link

11.3 Geometric Design Standards

Details of the road class are shown in the Tables 11.3.1 and 11.3.2 below.

Table 11.3.1 : Class 3 – District Distributor

Design speed	70km/h
Minimum radius for horizontal curves and superelevation	260m
Minimum gradient	0,67%
Recommended maximum gradient	8%
Maximum gradient over short sections [Gradient(%) / Maximum length(m)]	8% over 150m
Minimum K-value: Crest	23
Minimum K-value: Sag	12

Table 11.3.2 : Class 5 – Major Residential Access Link

Design speed	40km/h
Minimum radius for horizontal curves and superelevation	45m
Minimum gradient	0,67%
Recommended maximum gradient	10%
Maximum gradient over short sections [Gradient(%) / Maximum length(m)]	12.5% over 70m
Minimum K-value: Crest	2
Minimum K-value: Sag	4

11.4 Pavement Design

The proposed pavement design will be based on anticipated traffic volumes and the in-situ material. The design life of the proposed pavement will be 20 years on the provision that the pavement will be maintained to sustain its skid resistance and permeability during the design life of the pavement.

The proposed pavement designs are shown in Tables 11.4.1 and 11.4.2 below.

Table 11.4.1 : Pavement Design Proposed for Class 3 Roads

Wearing course	25mm thick continuously – graded medium grade asphalt – AC. (see note below)
Base	150mm thick graded crushed stone compacted to 98% of apparent density – G1. (see note below)
Sub base	150mm thick stabilized natural gravel compacted to 95% of modified AASHTO density. Minimum UCS = 1 200kPa at 95% of modified AASHTO density – C4
Selected sub grade	150mm thick natural gravel compacted to 95% of modified AAHSTO density. Minimum CBR = 25 at 95% of modified AASHTO density – G6 (in-situ or imported)
Upper Selected	150mm thick natural gravel compacted to 95% of modified AAHSTO density. Minimum CBR = 25 at 95% of modified AASHTO density – G5 (in-situ or imported)
Fill (where required)	150mm thick layers compacted to 93% of modified AASHTO density. Minimum CBR = 7 at 93% of modified AASHTO density – G9

Table 11.4.2 : Pavement Design Proposed for Class 5 Roads

Paving	80mm interlocking paving blocks with 20mm compacted sand bedding
Sub base	150mm sub base stabilised to C4
Selected Layer	150mm thick natural gravel compacted to 95% of modified AAHSTO density. Minimum CBR = 25 at 95% of modified AASHTO density – G6 (in-situ or imported)
Road bed	150mm thick layers compacted to 93% of modified AASHTO density. Minimum CBR = 7 at 93% of modified AASHTO density – G9

12. SOLID WASTE DISPOSAL

12.1 Volume of Solid Waste

The estimated volume of solid waste to be generated by the Proposed Development weekly is shown in Table 12.1 below.

Table 12.1 : Estimated Volume of Solid Waste

Zoning	Proposed Development	
	No. of Erven / No. of Units / Floor Area / Size (ha)	Volume of Solid Waste (m³/Week)
Residential 1 (60 units/ha)	6 560.00 Erven	984.00
Residential 2 (75 units/ha)	330.00 Units	49.50
Business 1	23 100.00m²	57.75
Place of Worship	3 500.00m²	8.75
Municipal	1 600.00m²	4.00
Community Facility	2 100.00m²	5.25
Health Centre	8 400.00m²	21.00
Library	5 600.00m²	14.00
Police Station	8 400.00m²	21.00
Primary School	4.20ha	63.00
Combined School	7.40ha	70.60
Crèche	0.40ha	10.00
Sports Field	1.90ha	28.50
Public Open Space	12.60ha	0.00
Streets	53.80ha	0.00
Total		**1 337.25**

The solid waste generated by the Proposed Development will be collected by the Mangaung Metropolitan Municipality (MMM) and transported to the solid waste disposal site of the Mangaung Metropolitan Municipality (MMM).

13. ELECTRICAL ENGINEERING SERVICES

13.1 Introduction

The Proposed Development will be supplied with electricity from the Centlec Power Supply Network.

Centlec will take over the network once the development is completed. They will then be responsible for the operation and maintenance of the network.

The standards and specifications for materials and design prescribed by Centlec must be followed.

13.2 Estimated Maximum Demand

The total estimated maximum demand of the Proposed Development is shown in Table 13.2.

Table 13.2 : Estimated Maximum Demand

Zoning	Proposed Development		
	Floor Area (m^2) / No. of Units	Unit Load Assumption (kVA / Unit) (VA / m^2)	Load (kVA)
Residential 1 (50 units/ha)	6 560.00 Erven	3.5	22 960.0
Residential 2 (75 units/ha)	330.00 Units	2.5	825.0
Business 1	23 100.00m^2	80VA/m^2	1 848.0
Place of Worship	3 500.00m^2	80VA/m^2	280.0
Municipal	1 600.00m^2	80VA/m^2	128.0
Community Facility	2 100.00m^2	60VA/m^2	126.0
Health Centre	8 400.00m^2	80VA/m^2	672.0
Library	5 600.00m^2	60VA/m^2	336.0
Police Station	8 400.00m^2	80VA/m^2	672.0
Primary School	29 400.00	20VA/m^2	588.0
Combined School	51 800.00	20VA/m^2	1 036.0
Crèche	2 800.00	20VA/m^2	56.0
Sports Field	13 300.00	40VA/m^2	532.0
Total			**30 059.0**

13.3 Estimated Maximum Demand with reduced supply from Electricity Supplier

Due to the shortage of electrical capacity in South Africa and the focus on energy saving, it is a requirement that new developments make use of energy saving methods. The required capacity could therefore be reduced by replacing the electrical stove plates of each individual residential unit with gas plates, heating the water with solar or gas and using energy saving lights. The electrical maximum demand of an individual unit could be reduced as shown in Tables 13.3.1 and 13.3.2.

Table 13.3.1 : Estimated Maximum Demand with Conventional Electrical Appliances

Estimated ADMD (After Diversity Maximum Demand) per Dwelling before Alternative Energy					
Appliance	Quantity	Load/ Appliance (kVA)	Contribution to the Maximum Demand	Estimated Connected Load (kVA)	ADMD Load (kVA)
Geyser 1	1	2	100%	2.0	0.7
Lights	12	0.06	70%	0.5	0.17
Heater	1	1.2	80%	1.0	0.3
Television	1	0.2	100%	0.2	0.07
Decoder	1	0.2	100%	0.2	0.07
Computer	1	0.35	40%	0.1	0.05
Stove Plates	4	1	70%	2.8	0.93
Oven	1	2.8	50%	1.4	0.47
Fridge	1	0.75	60%	0.5	0.15
Kettle	1	1.25	50%	0.6	0.21
Microwave	1	1.25	50%	0.6	0.21
Washing Machine	1	3	15%	0.5	0.15
Clothing Iron	1	0.85	10%	0.1	0.03
Total				10.4	3.5

Table 13.3.2 : Estimated Reduced Maximum Demand with Solar and Gas Alternatives

Estimated ADMD per Dwelling (Gas stoves, gas or solar geysers and energy saver Lights)					
Appliance	**Quantity**	**Load/ Appliance (kVA)**	**Contribution to the Maximum Demand**	**Estimated Connected Load (kVA)**	**ADMD Load (kVA)**
Geyser 1	0	2	100%	0.0	0.0
Lights	12	0.015	70%	0.1	0.04
Heater	1	1.2	80%	1.0	0.3
Television	1	0.2	100%	0.2	0.1
Decoder	1	0.2	100%	0.2	0.1
Computer	1	0.35	40%	0.1	0.0
Stove Plates	0	1	70%	0.0	0.0
Oven	1	2.8	50%	1.4	0.5
Fridge	1	0.75	60%	0.5	0.2
Kettle	1	1.25	50%	0.6	0.2
Microwave	1	1.25	50%	0.6	0.2
Washing Machine	1	3	15%	0.5	0.2
Clothing Iron	1	0.85	10%	0.1	0.03
Total				**5.3**	**1.8**

Table 13.3.3 shows the total estimated reduced maximum demand of the Proposed Development if the abovementioned recommendations are implemented. The estimated capacity per dwelling can be reduced by one circuit breaker level from 3.5kVA per house to 2kVA per house to allow for a safety margin in the event that not all possible energy saving methods are implemented and to allow for extreme cases of simultaneous maximum demand of the dwellings.

Table 13.3.3 : Estimated Reduced Maximum Demand

Zoning	Proposed Development		
	Floor Area (m²) / No. of Units	Unit Load Assumption (kVA / Unit) (VA / m²)	Load (kVA)
Residential 1 (50 units/ha)	6 560.00 Erven	2	13 120.0
Residential 2 (75 units/ha)	330.00 Units	1.8	594.0
Business 1	23 100.00m²	60VA/m²	1 386.0
Place of Worship	3 500.00m²	80VA/m²	280.0
Municipal	1 600.00m²	80VA/m²	128.0
Community Facility	2 100.00m²	60VA/m²	126.0
Health Centre	8 400.00m²	80VA/m²	672.0
Library	5 600.00m²	60VA/m²	336.0
Police Station	8 400.00m²	80VA/m²	672.0
Primary School	29 400.00	20VA/m²	588.0
Combined School	51 800.00	20VA/m²	1 036.0
Crèche	2 800.00	20VA/m²	56.0
Sports Field	13 300.00	40VA/m²	532.0
Total (before Diversity)			**19 526.0**
Total (after Diversity of 80%)			**15 620.8**

13.4 External Supply Network

The electrical supply to the development will require the construction of a new 132/11kV Distribution Centre. The new Distribution Centre will be constructed on a 100m x 100m servitude in favour of Centlec.

The position of the Distribution Centre will be determined by the construction of a new 132kV ring network from the Flora Distribution Centre to the Coronation Distribution Centre. If the aforementioned 132kV line does not proceed then a new 132kV line to the new Distribution Centre may have to be constructed from the Flora Distribution Centre.

The short-term electrical capacity requirement could possibly be accommodated by installing 11kV cables from the nearest MV ring network with spare capacity up to the border of the Proposed Development.

Due to the size of the development it is envisaged that a minimum of three (3) primary substations will have to be constructed within the development in order to distribute the 11kV throughout the development. The primary substations will be supplied from the new Distribution Centre with 240mm^2 copper cables using a single contingency model (n-1).

An application for the required electrical capacity was send to the Centlec on 21 January 2020. A copy of this letter is attached as Annexure D.

14. BULK SERVICES CONTRIBUTIONS

The amount of Bulk Services Contributions for civil engineering services, payable to the Mangaung Metropolitan Municipality (MMM), if applicable, will be determined with the compilation of the services agreement.

The total amount of Bulk Services Contributions payable to Centlec for electricity will be determined with the compilation of the services agreement.

15. COST ESTIMATES

15.1 Water and Sewerage

The cost estimates for the installation of the bulk internal and external water and sewerage services are shown in Table 15.1 below.

Table 15.1 : Cost Estimates for Internal and External Water and Sewerage Engineering Services

Item No.	Description	Internal		External	
A	Civil	Water (R)	Sewerage (R)	Water (R)	Sewerage (R)
A1	**Construction Costs**				
A1.1	Preliminary and General	7 205 770-95	6 751 280-40	-	6 084 798-00
A1.2	Water Mains	34 399 773-00	-	-	-
A1.2.2	Ground Level Reservoir incl. Pump station	8 504 870-00	-	-	-
A1.2.3	Elevated Storage Reservoir	5 133 830-00	-	-	-
A1.3	Sewer Mains	-	45 008 596-00	-	40 565 320-00
Total A		**55 244 243-95**	**51 759 885-40**	**-**	**46 650 118-00**
B	**Professional Fees**				
B1	Civil Services	5 524 424-40	5 175 988-54	-	4 665 011-80
Total B		**5 524 424-40**	**5 175 988-54**	**-**	**4 665 011-80**
Total (A + B)		**60 768 668-35**	**56 935 873-94**	**-**	**51 315 129-80**
Contingencies (10%)		**6 076 866-63**	**5 693 587-39**	**-**	**5 131 512-98**
VAT (15%)		**10 026 830-28**	**9 394 419-20**	**-**	**8 466 996-42**
Total (VAT Included)		**76 872 365-44**	**72 023 880-53**	**-**	**64 913 639-20**

15.2 Roads and Storm Water

The cost estimates for the construction of the roads and storm water infrastructure are shown in Table 15.2 below.

Table 15.2 : Preliminary Cost Estimates for Roads and Storm Water Infrastructure

Item No.	Description	Amount (R)
A	**Roads and Storm Water Infrastructure**	
A1.1	**Internal**	
A1.1.1	Preliminary and General	44 641 821-83
A1.1.2	Storm Water Drainage	55 750 971-00
A1.1.3	Roads	241 861 174-50
Total A1.1		**342 253 967-33**
A1.2	**External**	
A1.2.1	Preliminary and General	8 627 447-48
A1.2.3	Storm Water Drainage	10 649 508-86
A1.2.4	Roads	46 200 141-00
Total A1.2		**65 377 097-34**
Total A		**407 631 064-67**
B	**Professional Fees**	
B1	**Civil**	
B1.1	Design and Construction Supervision	40 763 106-47
Total B		**40 763 106-47**
Total Construction Cost		
Total A+B		**448 394 171-13**
Contingencies (10%)		**44 839 417-11**
VAT (15%)		**73 986 038-24**
Total (VAT included)		**567 218 626-48**

16. CONCLUSION

We trust that the above report meets with your requirements. Please contact us should you require any additional information.

.....

Leon Wentzel
for CIVILCONSULT Projects (Pty) Ltd

09/07/2020
.....
Date

ANNEXURE A

LOCALITY PLAN

NOTES / NOTAS

DEVELOPMENT BOUNDARY

PROPOSED DEVELOPMENT

REFERENCE / VERWYSINGS

MANGAUNG METROPOLITAN MUNICIPALITY

NGOTI DEVELOPMENT CONSULTANTS

CIVILCONSULT Consulting Engineers

	L. WENTZEL
	F. TEUBLANCHE
	P.C. PRINS

PROJECT NAME

TOWNSHIP ESTABLISHMENT ON A PORTION OF THE REMAINDER OF THE FARM KLIPFONTEIN 716 AND FARM CERES 626 BLOEMFONTEIN

DRAWING TITLE / TEKENINGTITEL

LOCALITY PLAN

DATE / DATUM: APRIL 2020

SCALE / SKAAL: AS SHOWN

2698/100/01/00

—

2698/100/01/00

ANNEXURE B

TOWNSHIP LAYOUT PLAN

PROPOSED TOWNSHIP:

situated on:

A PORTION OF THE FARM KLIPFONTEIN 716 AND FARM CERES 626, BLOEMFONTEIN

LAND USE

ZONING	LAND USE		No. OF STANDS	AREA Ha	% OF AREA
RESIDENTIAL 1	RESIDENTIAL		[illegible]	131.2	56
RESIDENTIAL 2	SOCIAL HOUSING		2	4.4	1.2
BUSINESS 1	BUSINESS		2	3.3	1.4
INSTITUTIONAL	COMMUNITY FACILITY		3	0.3	0.1
	HEALTH CENTRE		1	1.2	0.5
	LIBRARY		1	0.6	0.3
	POLICE STATION		1	1.2	0.5
RECREATIONAL	SPORTS FIELD		1	1.9	0.8
EDUCATIONAL	PRIMARY SCHOOL		2	[illegible]	[illegible]
	COMBINED SCHOOL		1	[illegible]	[illegible]
	CRECHE		[illegible]	0.4	0.2
PLACE OF WORSHIP	CHURCH		[illegible]	0.4	0.2
MUNICIPAL	MUNICIPAL		1	0.2	0.1
PUBLIC OPEN SPACE	PUBLIC OPEN SPACE		[illegible]	[illegible]	[illegible]
STREETS	-		-	[illegible]	[illegible]
TOTAL			[illegible]	[illegible]	100

GENERAL NOTES

CLIENT : MANGAUNG METRO MUNICIPALITY

Designed: S.DLAMINI

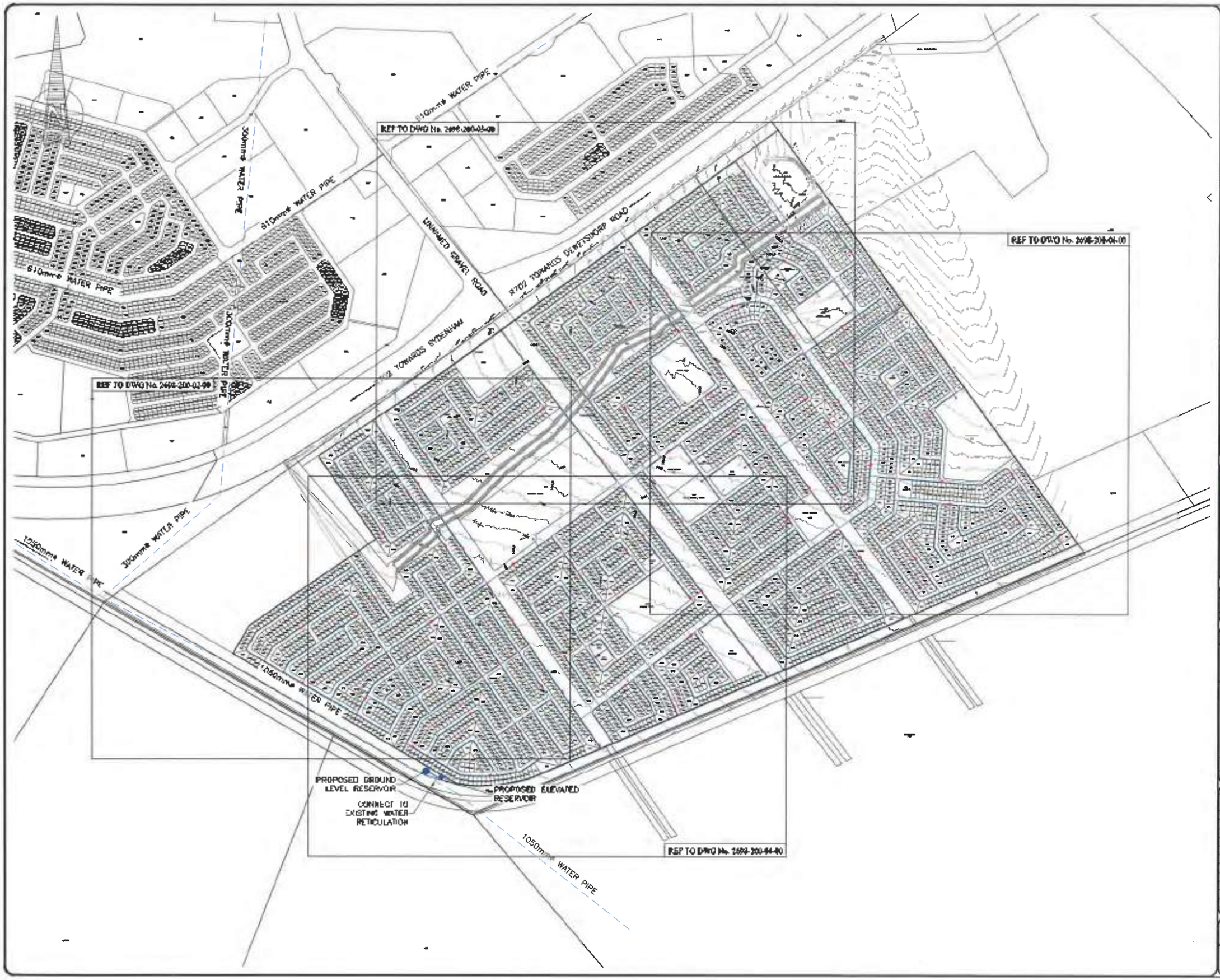
Checked: F.MATHEBULA

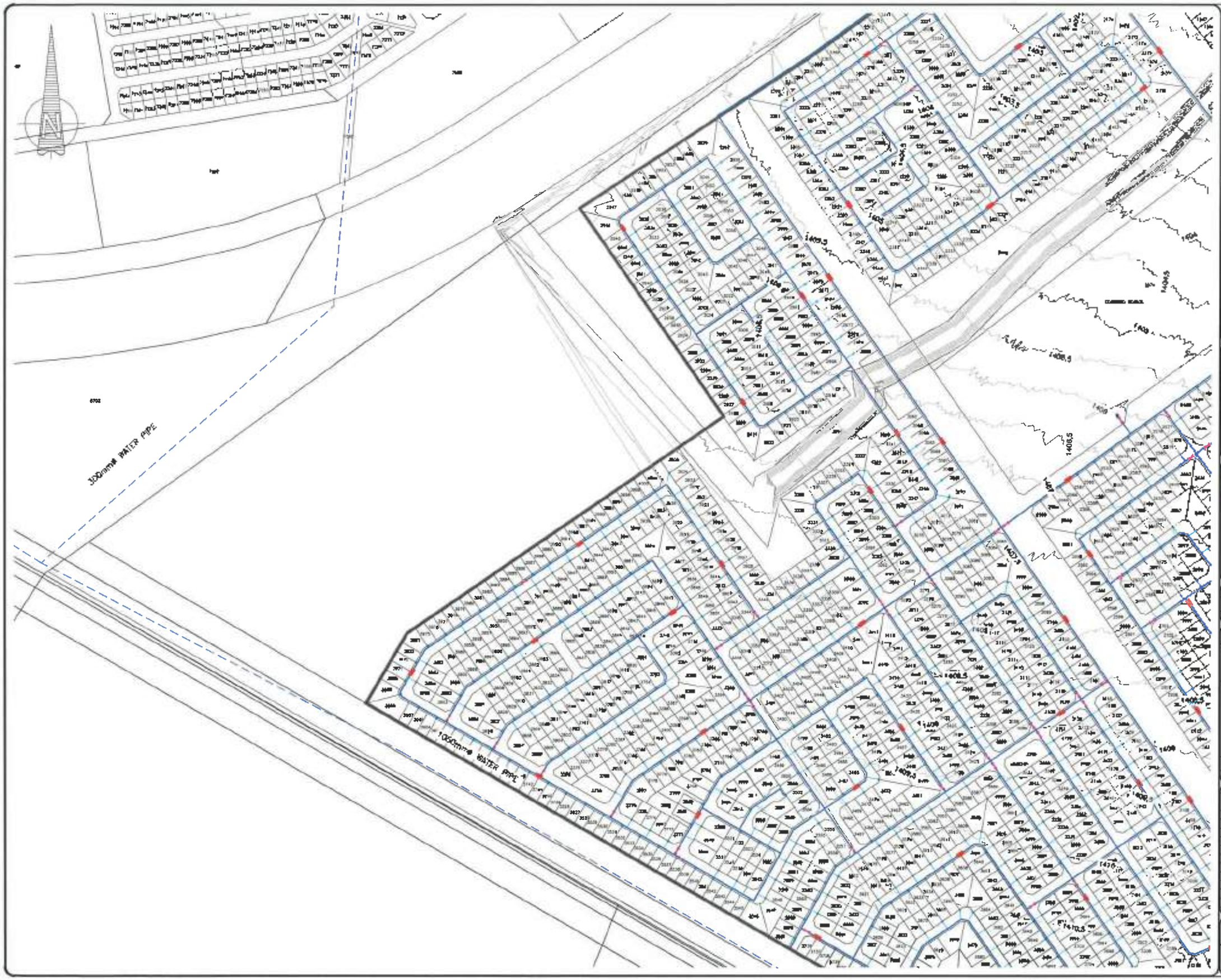
PLAN NO.	DATE:	SCALE
KLIP002/2020	MARCH 2020	1:3000

NGOTI DEVELOPMENT CONSULTANTS

ANNEXURE C

PRELIMINARY ENGINEERING LAYOUT DRAWINGS


NOTES / NOTAS
DEVELOPMENT BOUNDARIES
EXISTING WATER PIPES
PROPOSED WATER PIPES
PROPOSED DOUBLE CONNECTION
PROPOSED SINGLE CONNECTION
PROPOSED VALVES
PROPOSED FIRE HYDRANTS
PROPOSED BULK WATER METER
REFERENCE / VERWYSING
MANGAUNG METROPOLITAN MUNICIPALITY
CLIENT / KLIENT
NGOTI
NGOTI DEVELOPMENT CONSULTANTS
CIVILCONSULT
Consulting Engineers
ENGINEER / INGENIEUR
L. WENTZEL
DESIGN / ONTWERP
E. TERBLANCHE
TRACED / NAGETEKE
DRAWN / GETEKEN
R. BURGES
CHECKED / NAGEKEN
PROJECT / PROJEK
OWNSHIP ESTABLISHMENT ON A PORTION OF THE REMAINDER OF THE FARM BAINSVLEI 716 AND FARM COREE 636 BLOEMFONTEIN
GENERAL LAYOUT:
WATER
SHEET 1 OF 5
DATE / DATUM
JULY 2020
SCALE / SKAAL
1:5000
DRAWING NO. / TEKENING NR.
2698/200/01/00
REV. NO.
-
REF TO DWG No. 2698-200-02-00
REF TO DWG No. 2698-200-03-00
REF TO DWG No. 2698-200-04-00
REF TO DWG No. 2698-200-04-00
610mm WATER PIPE
610mm WATER PIPE
300mm WATER PIPE
300mm WATER PIPE
UNNAMED GRAVEL ROAD
R702 TOWARDS DEWETSDORP ROAD
R13 TOWARDS SYDENHAM
1050mm WATER PIPE
300mm WATER PIPE
1050mm WATER PIPE
PROPOSED GROUND LEVEL RESERVOIR
CONNECT TO EXISTING WATER RETICULATION
PROPOSED ELEVATED RESERVOIR
1050mm WATER PIPE
REF TO DWG No. 2698-200-04-00
2698/200/01/00



- DEVELOPMENT BOUNDARIES
- EXISTING WATER PIPES
- PROPOSED WATER PIPES
- PROPOSED DOUBLE CONNECTION
- PROPOSED SINGLE CONNECTION
- PROPOSED VALVES
- PROPOSED FIRE HYDRANTS
- PROPOSED BULK WATER METER

MANGAUNG METROPOLITAN MUNICIPALITY

NGOTI DEVELOPMENT CONSULTANTS

CIVILCONSULT
Consulting Engineers

: L. WENTZEL
: T. VENNAANCHE
: R. BENNIES

TOWNSHIP ESTABLISHMENT ON A PORTION OF THE REMAINDER OF THE FARM KLIPFONTEIN 716 AND FARM CERES 626 BLOEMFONTEIN

GENERAL LAYOUT:
WATER
SHEET 2 OF 3

: JULY 2020
: 1:2000

No.	Date	Drawn	Description

2698/2000/2/00

2698/2000/2/00

DEVELOPMENT BOUNDARIES
EXISTING WATER PIPES
PROPOSED WATER PIPES
PROPOSED DOUBLE CONNECTION
PROPOSED SINGLE CONNECTION
PROPOSED VALVES
PROPOSED FIRE HYDRANTS
PROPOSED BULK WATER METER

MANGAUNG METROPOLITAN MUNICIPALITY

NGOTI DEVELOPMENT CONSULTANTS

CIVILCONSULT
Consulting Engineers

E.L. WENTZEL
A. TERBLANCHE — TRACED
R. BEUKES — CHECKED

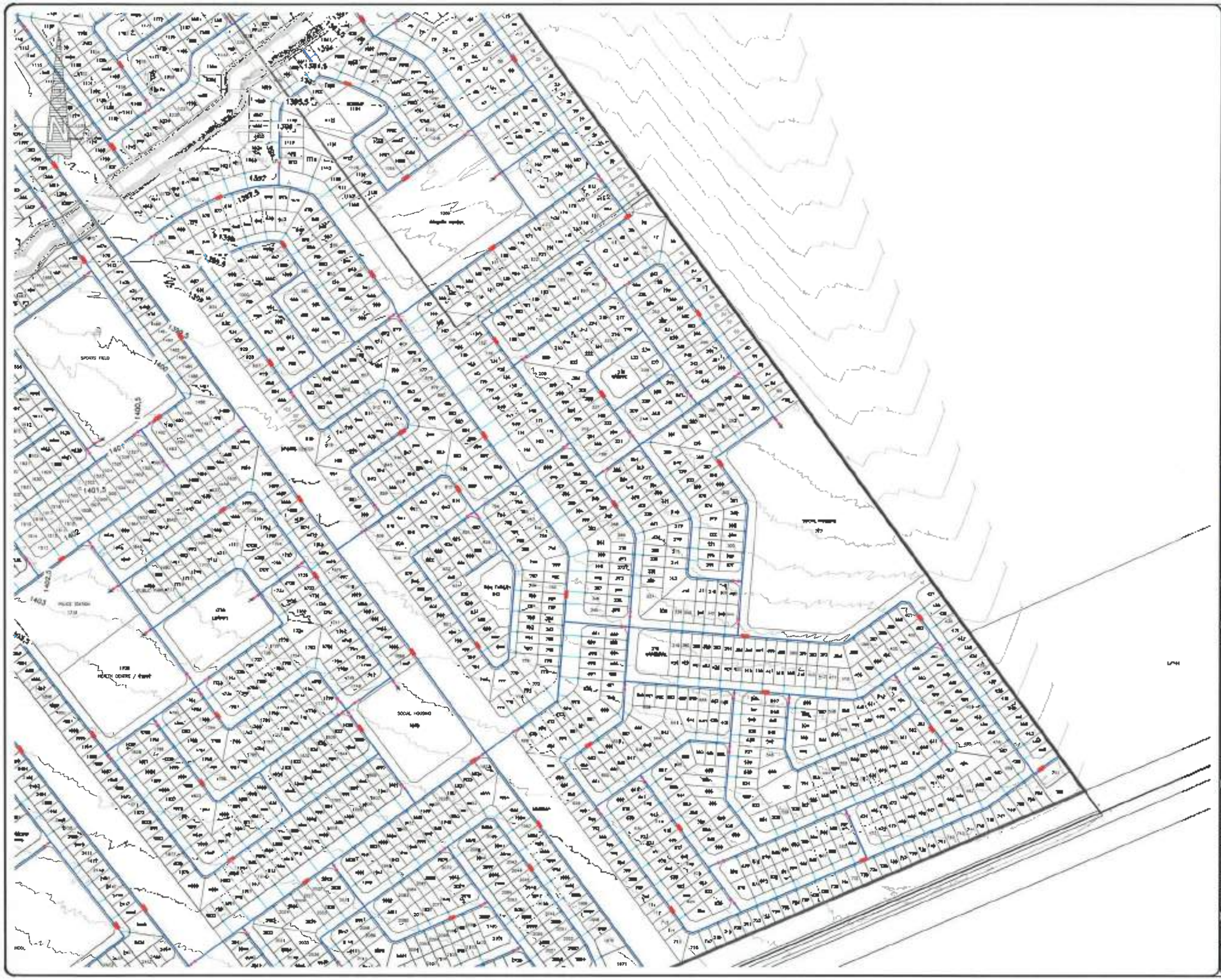
TOWNSHIP ESTABLISHMENT ON A PORTION OF THE REMAINDER OF THE FARM KLIPFONTEIN 716 AND FARM CERES 626 BLOEMFONTEIN

GENERAL LAYOUT:
WATER
SHEET 3 OF 5

DATE : JULY 2020
DATUM:
SCALE : 1:2000

2698/200/03/00

2698/200/03/00



NOTES / LEGEND

- DEVELOPMENT BOUNDARIES
- EXISTING WATER PIPES
- PROPOSED WATER PIPES
- PROPOSED DOUBLE CONNECTION
- PROPOSED SINGLE CONNECTION
- PROPOSED VALVES
- PROPOSED FIRE HYDRANTS
- PROPOSED BULK WATER METER

REFERENCE / VERWYSING

MANGAUNG

MANGAUNG METROPOLITAN MUNICIPALITY

CLIENT / KLIËNT

NGOTI

NGOTI DEVELOPMENT CONSULTANTS

CIVILCONSULT
Consulting Engineers

DESIGNED	L. WENTZEL
DRAWN	P. TERBLANCHE
CHECKED	S. BEUKES
TRACED	
CHECKED	

PROJECT NAME

TOWNSHIP ESTABLISHMENT ON A PORTION OF THE REMAINDER OF THE FARM KLIPFONTEIN 210 AND FARM CERES 656 BLOEMFONTEIN

GENERAL LAYOUT:
WATER
SHEET 4 OF 5

DATE	JULY 2020
SCALE	1:2000

REVISIONS

NO.	DATE	INITIAL	DESCRIPTION

CIVILCONSULT PROJECT NO. 2698/200004/00	FILE REFERENCE NO.
CONSULTANT PROJECT NO. --	FILE REFERENCE NO. -

2698/200004/00

PROPOSED GROUND LEVEL RESERVOIR

PROPOSED ELEVATED RESERVOIR

CONNECT TO EXISTING WATER RETICULATION

LEGEND / NOTES

- DEVELOPMENT BOUNDARIES
- EXISTING WATER MAINS
- PROPOSED WATER MAINS
- PROPOSED DOUBLE CONNECTION
- PROPOSED SINGLE CONNECTION
- PROPOSED VALVES
- PROPOSED FIRE HYDRANTS
- PROPOSED BULK WATER METER

REFERENCE / VERWYSING

MANGAUNG METROPOLITAN MUNICIPALITY

NGOTI DEVELOPMENT CONSULTANTS

CIVILCONSULT
Consulting Engineers

L. WENTZEL
B TERBLANCHE
B. BEUKES

TOWNSHIP ESTABLISHMENT ON A PORTION OF THE REMAINDER OF THE FARM KLIPFONTEIN 726 AND FARM CERES 526 BLOEMFONTEIN

DRAWING TITLE / TEKENNINGTITEL

GENERAL LAYOUT:
WATER
SHEET 5 OF 5

JULY 2020

1:2000

2698/200/05/00

2698/200/05/00

-

N1

N6

PORTION 1

PORTION 2

PORTION 3

PORTION 4

PROPOSED DEVELOPMENT

PORTION 5

PORTION 6

PORTION 7

PORTION 8

PORTION 9

PORTION 10

PORTION 11

PORTION 12

PORTION 13

PORTION 14

PORTION 15

PROPOSED 750mmØ BULK WATER DISTRIBUTION PIPELINE. ±2 548m

PROPOSED 1100mmØ BULK WATER DISTRIBUTION PIPELINE ±1 993m

PROPOSED 1400mmØ BULK WATER DISTRIBUTION PIPELINE. ±3 685m

PROPOSED 1800mmØ BULK WATER DISTRIBUTION PIPELINE ±450m

PROPOSED BULK WATER CONNECTION FROM THE EXISTING 1050mmØ BULK WATER PIPE

PROPOSED RESERVOIR FEEDER PIPE TO BE INSTALLED

PROPOSED NEW RESERVOIR TO BE CONSTRUCTED EXACT POSITION TO BE CONFIRMED

NOTES / NOTAS

DEVELOPMENT BOUNDARIES
PORTION BOUNDARIES
EXISTING 750mmØ BULK WATER PIPE
PROPOSED 400mmØ BOREHOLE FEEDER PIPE
PROPOSED 630mmØ BULK WATER PIPE
PROPOSED 840mmØ BULK WATER PIPE
PROPOSED 1050mmØ BULK WATER PIPE
PROPOSED 1400mmØ BULK WATER PIPE
PROPOSED RESERVOIR
EXISTING NATIONAL ROUTE

REFERENCE / VERWYSINGS

MANGAUNG METROPOLITAN MUNICIPALITY

NGOTI DEVELOPMENT CONSULTANTS

CIVILCONSULT
Consulting Engineers

L. WENTZEL
E. TERBLANCHE
S.S. HEYNEKE

TOWNSHIP ESTABLISHMENT ON A PORTION OF THE REMAINDER OF THE FARM KLAPROOSFONTEIN 716 AND FARM CERES 426 BLOEMFONTEIN

DRAWING TITLE / TEKENINGTITEL

BULK WATER: GENERAL LAYOUT OPTION 3

DATE / DATUM: JUNE 2024
SCALE / SKAAL: 1:30 000

No.	Date	Initials	Description

2698/200/06/00 BULK

2698/200/06/00 BULK

NOTES / NOTAS

- DEVELOPMENT BOUNDARIES
- PROPOSED RESERVOIR
- EXISTING NATIONAL ROUTE

REFERENCE / VERWYSINGS

MANGAUNG METROPOLITAN MUNICIPALITY

NGOTI DEVELOPMENT CONSULTANTS

CIVILCONSULT Consulting Engineers

L. WENTZEL
E. TERBLANCHE
S.J. HENNING

TOWNSHIP ESTABLISHMENT ON A PORTION OF THE REMAINDER OF THE FARM KLIPFONTEIN 716 AND FARM CERES 626 BLOEMFONTEIN

DRAWING TITLE / TEKENSTUK

BULK WATER: GENERAL LAYOUT OPTION 1

JUNE 2020

1:10 000

No.	Date	Drawn	Description

2698/200007/00 BULK

2698/200007/00 BULK

PROPOSED SEWER OUTFALL PIPE TO CONNECT TO EXISTING WWTW

PROPOSED 625mmØ CONCRETE OUTFALL SEWER @0.06% SLOPE. ±1524m

EXISTING STORMWATER WASTE WATER TREATMENT WORKS (WWTW)

PROPOSED 525mmØ CONCRETE OUTFALL SEWER @0.75% SLOPE. ±2376m

REF TO DWG No.2698-300-05-00

PROPOSED START OF SEWER OUTFALL PIPE

REF TO DWG No.2698-300-03-00

SEWER CONNECTION FOR PROPOSED DEVELOPMENT

PROPOSED 250mmØ CONCRETE OUTFALL SEWER @0.92% SLOPE. ±1474m

REF TO DWG No.2698-300-04-00

REF TO DWG No.2698-300-02-00

NOTES / NOTAS

- DEVELOPMENT BOUNDARY
- PROPOSED SEWER
- PROPOSED SEWER MANHOLE
- EXISTING SEWER
- EXISTING SEWER MANHOLE
- PROPOSED 250mmØ OUTFALL SEWER
- PROPOSED 525mmØ OUTFALL SEWER
- PROPOSED 625mmØ OUTFALL SEWER
- EXISTING WASTE WATER TREATMENT WORKS

REFERENCE / VERWYSINGS

MANGAUNG METROPOLITAN MUNICIPALITY

CLIENT / KLIENT

NGOTI DEVELOPMENT CONSULTANTS

CIVILCONSULT Consulting Engineers

DESIGNED	L. VENTZEL
DRAWN	E. TERBLANCHE
CHECKED	W.S. BROOKS

PROJECT / PROJEK

OWNERSHIP ESTABLISHMENT ON A PORTION OF THE REMAINDER OF THE FARM KLEINFONTEIN 716 AND FARM CERES 620 BLOEMFONTEIN

DRAWING TITLE / TEKENINGTITEL

GENERAL LAYOUT:
SEWER
SHEET 1 OF 5

DATE / DATUM: JUNE 2020
SCALE / SKAAL: 1:5000

No.	DATE	DRAWN	DESCRIPTION

2698/300/01/00

2698/300/01/00

R702 TO BOS DEWETSDORP ROAD

NOTES / NOTAS

DEVELOPMENT BOUNDARY
PROPOSED SEWER
PROPOSED SEWER MANHOLE
EXISTING SEWER
EXISTING SEWER MANHOLE

REFERENCE / VERWYSINGS

MANGAUNG METROPOLITAN MUNICIPALITY

CLIENT / KLIENT

NGOTI DEVELOPMENT CONSULTANTS

CIVILCONSULT
Consulting Engineers

: L. WENTZEL
: R. TERBLANCHE
: W.S. BROOKS

TOWNSHIP ESTABLISHMENT ON A PORTION OF THE REMAINDER OF THE FARM KLIPFONTEIN 716 AND PARM CERES 626 BLOEMFONTEIN

GENERAL LAYOUT:
SEWER
SHEET 2 OF 5

JUNE 2020
1:2500

2698/300/02/00

2698/300/02/00

PROPOSED START OF SEWER OUTFALL PIPE

SEWER CONNECTION FOR PROPOSED DEVELOPMENT

R702 TOWARDS BRANDSTSDORP ROAD

R702 TOWARDS SYDENHAM

SASSMANN STREET

1389,5

1397

1401,5

1402,5

1403

1404,5

COMBINED SCHOOL

LIBRARY

DEVELOPMENT BOUNDARY
PROPOSED SEWER
PROPOSED SEWER MANHOLE
EXISTING SEWER
EXISTING SEWER MANHOLE

MANGAUNG METROPOLITAN MUNICIPALITY

NGOTI DEVELOPMENT CONSULTANTS

CIVILCONSULT
Consulting Engineers

L. WENTZEL

W.S. BRONKHORST

TOWNSHIP ESTABLISHMENT ON A PORTION OF THE REMAINDER OF THE FARM KLIPFONTEIN 714 AND FARM CERES 626 BLOEMFONTEIN

GENERAL LAYOUT:
SEWER
SHEET 3 OF 5

JUNE 2020

1:2000

2698/300/03/00

2698/300/03/00

NOTES / NOTAS

DEVELOPMENT BOUNDARY
PROPOSED SEWER
PROPOSED SEWER MANHOLE
EXISTING SEWER
EXISTING SEWER MANHOLE

REFERENCE / VERWYSING

MANGAUNG

MANGAUNG METROPOLITAN MUNICIPALITY

NGOTI

NGOTI DEVELOPMENT CONSULTANTS

CIVILCONSULT
Consulting Engineers

L WENTZEL

T TERBLANCHE

W.S. BROOKS

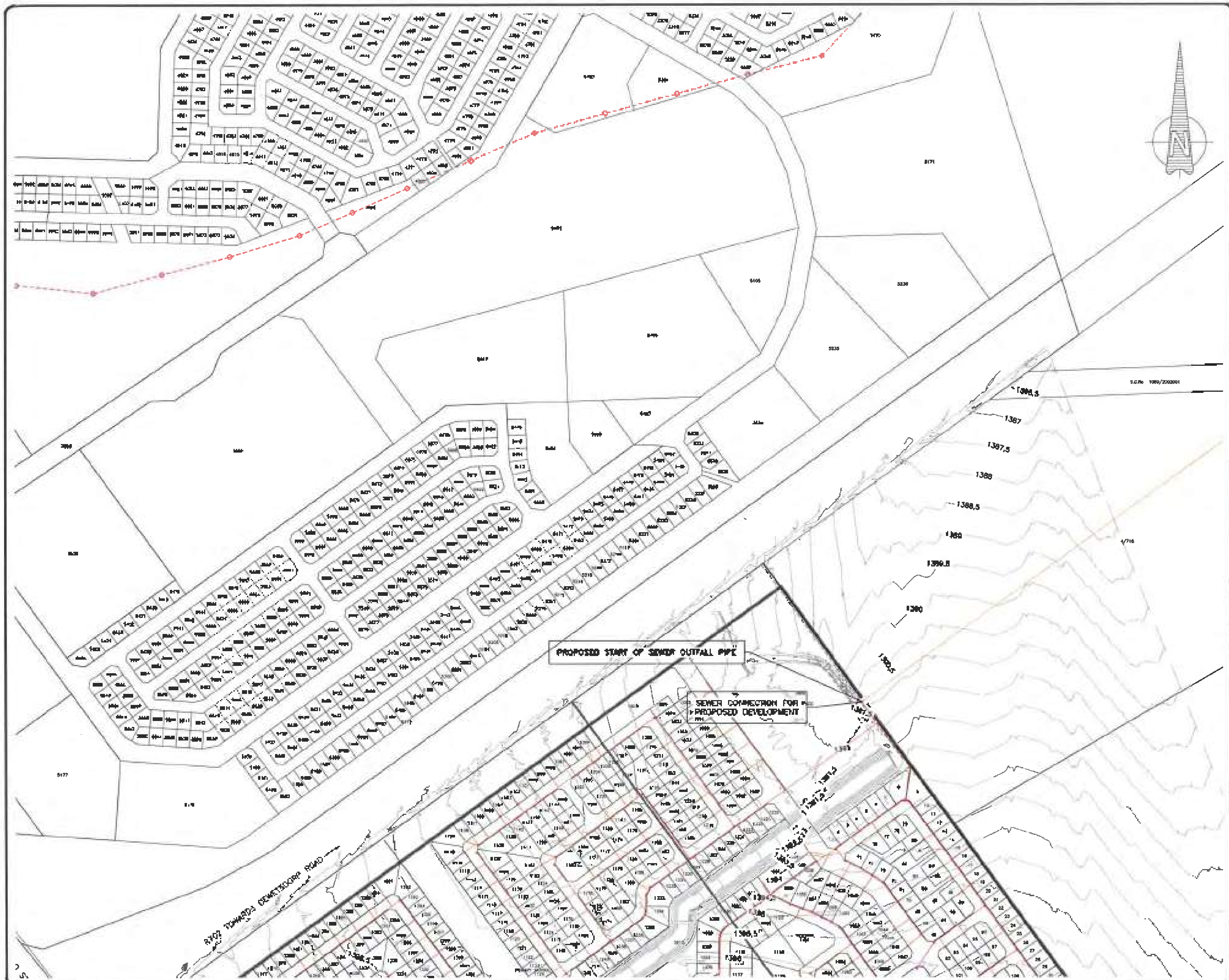
TOWNSHIP ESTABLISHMENT ON A PORTION OF THE REMAINDER OF THE FARM KAUPUNTEIN 916 AND FARM CERES 626 DILOTSHOPTEIN

GENERAL LAYOUT:
SEWER
SHEET 4 OF 5

DATE - JUNE 2020
SCALE - 1:2000

2698/300/04/00

2698/300/04/00



NOTES / NOTAS

- DEVELOPMENT BOUNDARY
- PROPOSED SEWER
- PROPOSED SEWER MANHOLE
- EXISTING SEWER
- EXISTING SEWER MANHOLE

MANGAUNG

MANGAUNG METROPOLITAN MUNICIPALITY

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NGOTI DEVELOPMENT CONSULTANTS

CIVILCONSULT
Consulting Engineers

L. WENTZEL

W.S BROOKS

TOWNSHIP ESTABLISHMENT ON A PORTION OF THE REMAINDER OF THE FARM KLIPFONTEIN 746 AND FARM CERES 626 BLOEMFONTEIN

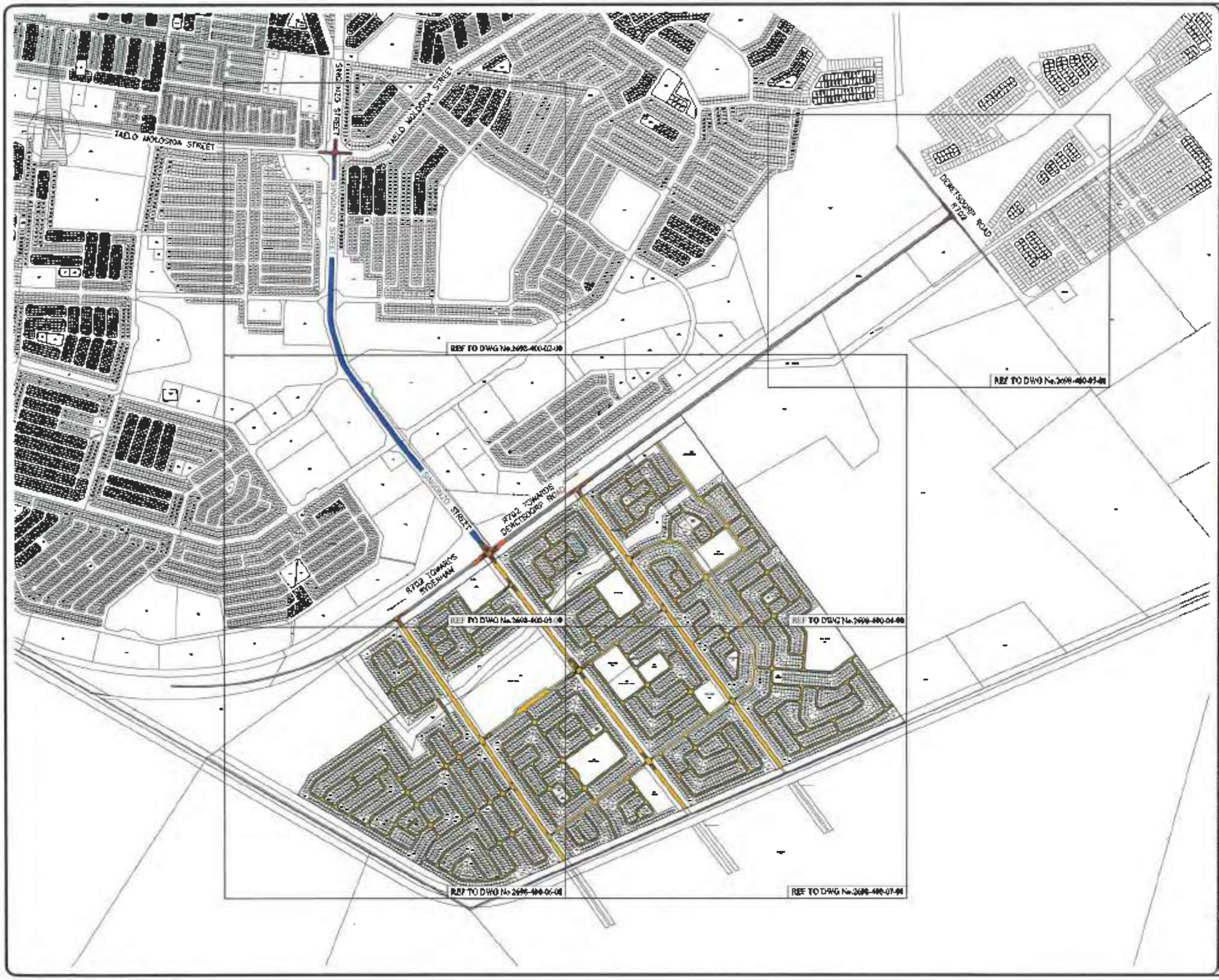
GENERAL LAYOUT:
SEWER
SHEET 5 OF 5

DATE / DATUM: JUNE 2020

SCALE / SKAAL: 1:2000

2698/300/05/00

2698/300/05/00



REFERENCE / VERWYSING

MANGAUNG METROPOLITAN MUNICIPALITY

NGOTI DEVELOPMENT CONSULTANTS

CIVILCONSULT Consulting Engineers

L. WENTZEL
E.TEN BLANCHE
R.BEUKES

TOWNSHIP ESTABLISHMENT ON A PORTION OF THE REMAINDER OF THE FARM KLIPFONTEIN 316 AND FARM CERES 436 BLOEMFONTEIN

GENERAL LAYOUT:
ROADS
SHEET 1 OF 7

JULY 2020

1:2000

2698/400/01/00

2698/400/01/00

SIMMONDS STREET

JAGLO MOLOSIWA STREET

45

30

32

BAGOMO STREET

DEVELOPMENT BOUNDARY
PROPOSED ROADS
EXISTING ROAD
PROPOSED ACCESS
PROPOSED INTERSECTIONS TO BE UPGRADED
EXISTING GRAVEL ROAD TO BE UPGRADED

MANGAUNG METROPOLITAN MUNICIPALITY

NGOTI DEVELOPMENT CONSULTANTS

CIVILCONSULT
Consulting Engineers

TOWNSHIP ESTABLISHMENT OF A PORTION OF THE REMAINDER OF THE FARM KLIPFONTEIN 716 AND FARM CRUIS 426 BLOEMFONTEIN

GENERAL LAYOUT:
ROADS
SHEET 2 OF 7

JULY 2000

2698/400/02/00

2698/400/02/00

NOTES / NOTAS

- DEVELOPMENT BOUNDARY
- PROPOSED ROADS
- EXISTING ROAD
- PROPOSED ACCESS
- EXISTING GRAVEL ROAD TO BE UPGRADED

MANGAUNG
AT THE HEART OF IT ALL

MANGAUNG METROPOLITAN MUNICIPALITY

NGOTI DEVELOPMENT CONSULTANTS

NGOTI DEVELOPMENT CONSULTANTS

CIVILCONSULT
Consulting Engineers

	L. WENTZEL
	S.TEMBA ANCHE
	R.REUKES

TOWNSHIP ESTABLISHMENT ON A PORTION OF THE REMAINDER OF THE FARM KLIPFONTEIN 716 AND FARM CERES 626 BLOEMFONTEIN

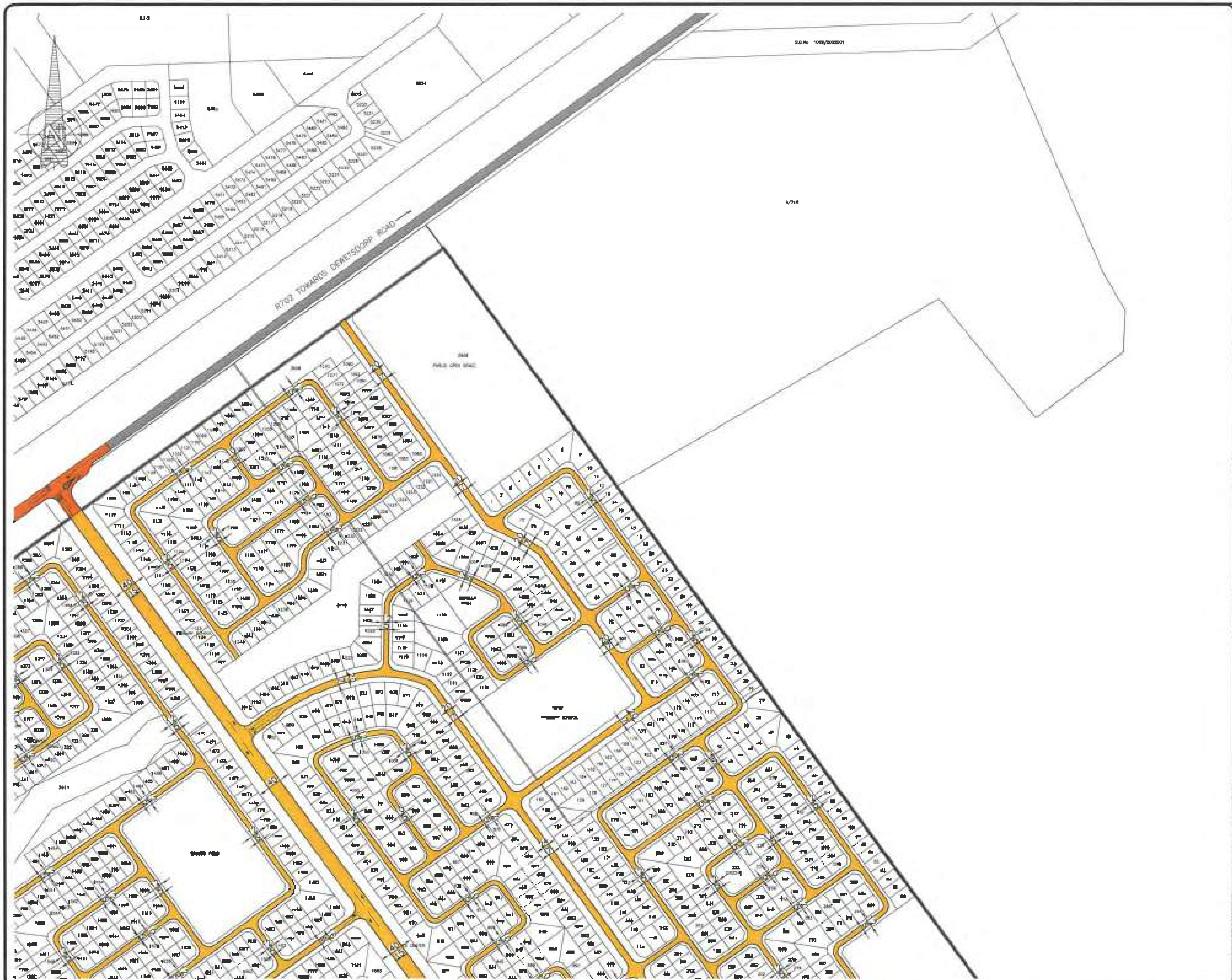
GENERAL LAYOUT:
ROADS
SHEET 3 OF 7

JULY 2020

1:2000

2698/400/03/00

2698/400/03/00



NOTES / NOTAS

- DEVELOPMENT BOUNDARY
- PROPOSED ROADS
- EXISTING ROAD
- PROPOSED ACCESS

MANGAUNG METROPOLITAN MUNICIPALITY

NGOTI DEVELOPMENT CONSULTANTS

CIVILCONSULT
Consulting Engineers

L. WENTZEL

TRACED / NAGETEK :

CHECKED / NAGESIEN :

TOWNSHIP ESTABLISHMENT ON A PORTION OF THE REMAINDER OF THE FARM KLIPFONTEIN 714 AND FARM CERES 626 BLOEMFONTEIN

GENERAL LAYOUT:
ROADS
SHEET 4 OF 7

DATE / DATUM: JULY 2020

SCALE / SKAAL: 1:2000

2698/400/04/00

2698/400/04/00

NOTES / NOTAS

- DEVELOPMENT BOUNDARY
- PROPOSED ROADS
- EXISTING ROAD
- PROPOSED ACCESS
- PROPOSED INTERSECTIONS TO BE UPGRADED

REFERENCE / VERWYSINGS

MANGAUNG
AT THE HEART OF IT ALL

MANGAUNG METROPOLITAN MUNICIPALITY

NGOTI

NGOTI DEVELOPMENT CONSULTANTS

CIVILCONSULT

L. WENTZEL

TOWNSHIP ESTABLISHMENT ON A PORTION OF THE REMAINDER OF THE FARM KLIPFONTEIN 716 AND FARM CERES 624 BLOEMFONTEIN

GENERAL LAYOUT:
ROADS
SHEET 5 OF 7

JULY 2020

1:2000

2698/400/05/00

—

-

2698/400/05/00

R702 TOWARDS SYDENHAM

R702 TOWARDS BENEFONTEIN ROAD

DEVELOPMENT BOUNDARY
PROPOSED ROADS
EXISTING ROAD
PROPOSED ACCESS

MANGAUNG

MANGAUNG METROPOLITAN MUNICIPALITY

NGOTI

NGOTI DEVELOPMENT CONSULTANTS

CIVILCONSULT
Consulting Engineers

L WRITZEL

R BEUKES

TOWNSHIP ESTABLISHMENT ON A PORTION OF THE REMAINDER OF THE FARM KLIPFONTEIN 716 AND FARM CORES 936 BLOEMFONTEIN

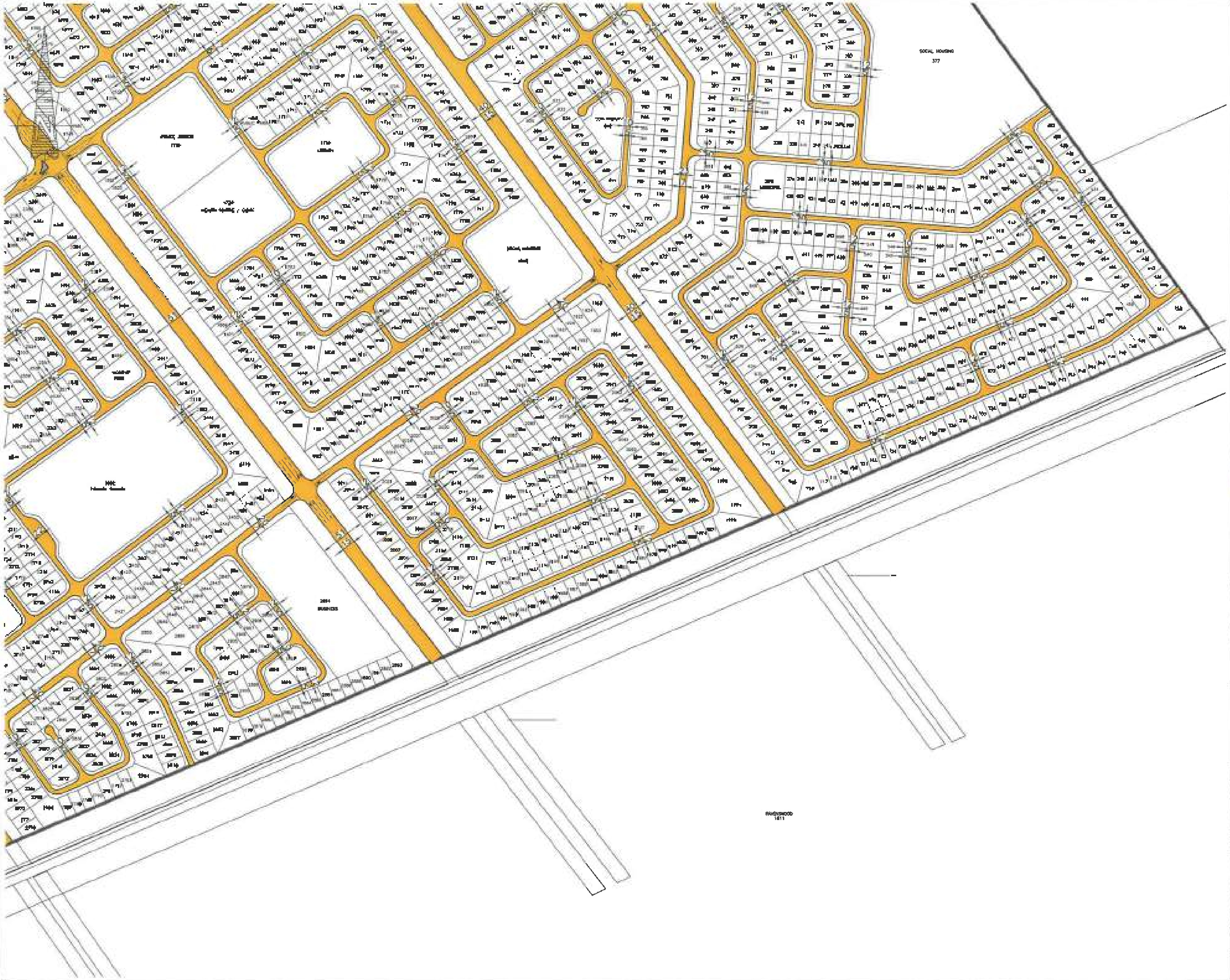
GENERAL LAYOUT:
ROADS
SHEET 6 OF 7

JULY 2000

1:2000

2698/400/06/00

2698/400/06/00



NOTES / NOTAS

- DEVELOPMENT BOUNDARY
- PROPOSED ROADS
- EXISTING ROAD
- PROPOSED ACCESS

MANGAUNG

MANGAUNG METROPOLITAN MUNICIPALITY

NGOTI

NGOTI DEVELOPMENT CONSULTANTS

CIVILCONSULT
Consulting Engineers

: L WENTZEL

: T TSHWANE

: R MAUMAS

TOWNSHIP ESTABLISHMENT ON A PORTION OF THE REMAINDER OF THE FARM KLIPFONTEIN 716 AND FARM CERES 626 BLOEMFONTEIN

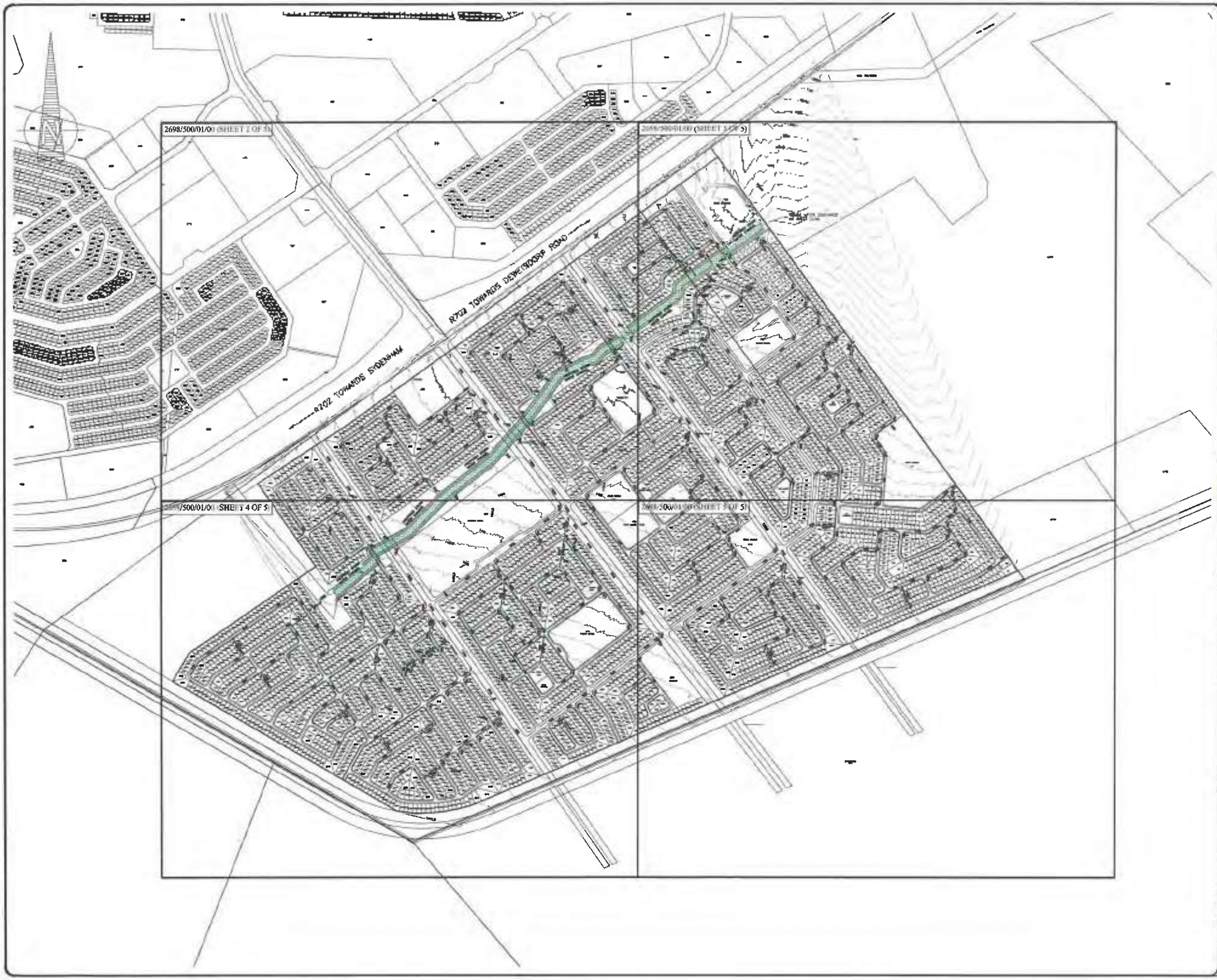
GENERAL LAYOUT: ROADS
SHEET 7 OF 7

JULY 2020

1:2000

2698/400/07/00

2698/400/07/00



NOTES / NOTAS

- DEVELOPMENT BOUNDARY
- PROPOSED STORM WATER MH
- PROPOSED JUNCTION BOX
- PROPOSED KERB INLET
- PROPOSED FIELD OUTLET
- EXISTING CULVERT
- PROPOSED STORM WATER CHANNEL

REFERENCE / VERWYSINGS

MANGAUNG
AT THE HEART OF IT ALL

MANGAUNG METROPOLITAN MUNICIPALITY

CLIENT / KLIENT

NGOTI DEVELOPMENT CONSULTANTS

CIVILCONSULT
Consulting Engineers

L. WENTZEL

TOWNSHIP ESTABLISHMENT ON A PORTION OF THE REMAINDER OF THE FARM KLIPFONTEIN 716 AND FARM ORRS 626 BLOEMFONTEIN

GENERAL LAYOUT:
STORM WATER
SHEET 1 OF 5

JULY 2020

1:5000

2698/500/01/00

2698/500/01/00

DEVELOPMENT BOUNDARY
PROPOSED STORM WATER PIPE
PROPOSED JUNCTION BOX
PROPOSED KERB INLET
PROPOSED FIELD OUTLET
EXISTING CULVERT
PROPOSED STORM WATER CHANNEL

REFERENCE / VERWYSINGS

MANGAUNG

MANGAUNG METROPOLITAN MUNICIPALITY

CLIENT / KLIENT

NGOTI

NGOTI DEVELOPMENT CONSULTANTS

CIVILCONSULT
Consulting Engineers

DESIGNED / ONTWERP: L. WENTZEL

TRACED / NAGETREK:

CHECKED / NAGESIEN:

TOWNSHIP ESTABLISHMENT ON A PORTION OF THE REMAINDER OF THE FARM KLIPFONTEIN 716 AND FARM CERES 626 BLOEMFONTEIN

GENERAL LAYOUT: STORM WATER SHEET 2 OF 5

DATE / DATUM: JULY 2020

SCALE / SKAAL: 1:2000

2698/500/02/00

2698/500/02/00

NOTES / NOTAS

- DEVELOPMENT BOUNDARY
- PROPOSED STORM WATER PIPE
- PROPOSED JUNCTION BOX
- PROPOSED KERB INLET
- PROPOSED FIELD OUTLET
- EXISTING CULVERT
- PROPOSED STORM WATER CHANNEL

REFERENCE / VERWYSINGS

MANGAUNG
AT THE HEART OF IT ALL

MANGAUNG METROPOLITAN MUNICIPALITY

CLIENT / KLIENT

NGOTI

NGOTI DEVELOPMENT CONSULTANTS

CIVILCONSULT
Consulting Engineers

: L. WENTZEL
: S. TERBLANCHE
: S. TERBLANCHE

TOWNSHIP ESTABLISHMENT ON A PORTION OF THE REMAINDER OF THE FARM KLIPFONTEIN 716 AND FARM CERES 626 BLOEMFONTEIN

GENERAL LAYOUT:
STORM WATER
SHEET 3 OF 5

DATE: JULY 2020
SCALE: 1:2000

2698/500/03/00

2698/500/03/00

DEVELOPMENT BOUNDARY
PROPOSED STORM WATER PIPE
PROPOSED JUNCTION BOX
PROPOSED KERB INLET
PROPOSED FIELD OUTLET
EXISTING CULVERT
PROPOSED STORM WATER CHANNEL

MANGAUNG

MANGAUNG METROPOLITAN MUNICIPALITY

NGOTI

NGOTI DEVELOPMENT CONSULTANTS

CIVILCONSULT

Consulting Engineers

L. WENTZEL

TOWNSHIP ESTABLISHMENT ON A PORTION OF THE REMAINDER OF THE FARM KLIPFONTEIN 216 AND FARM CERES 626 BLOEMFONTEIN

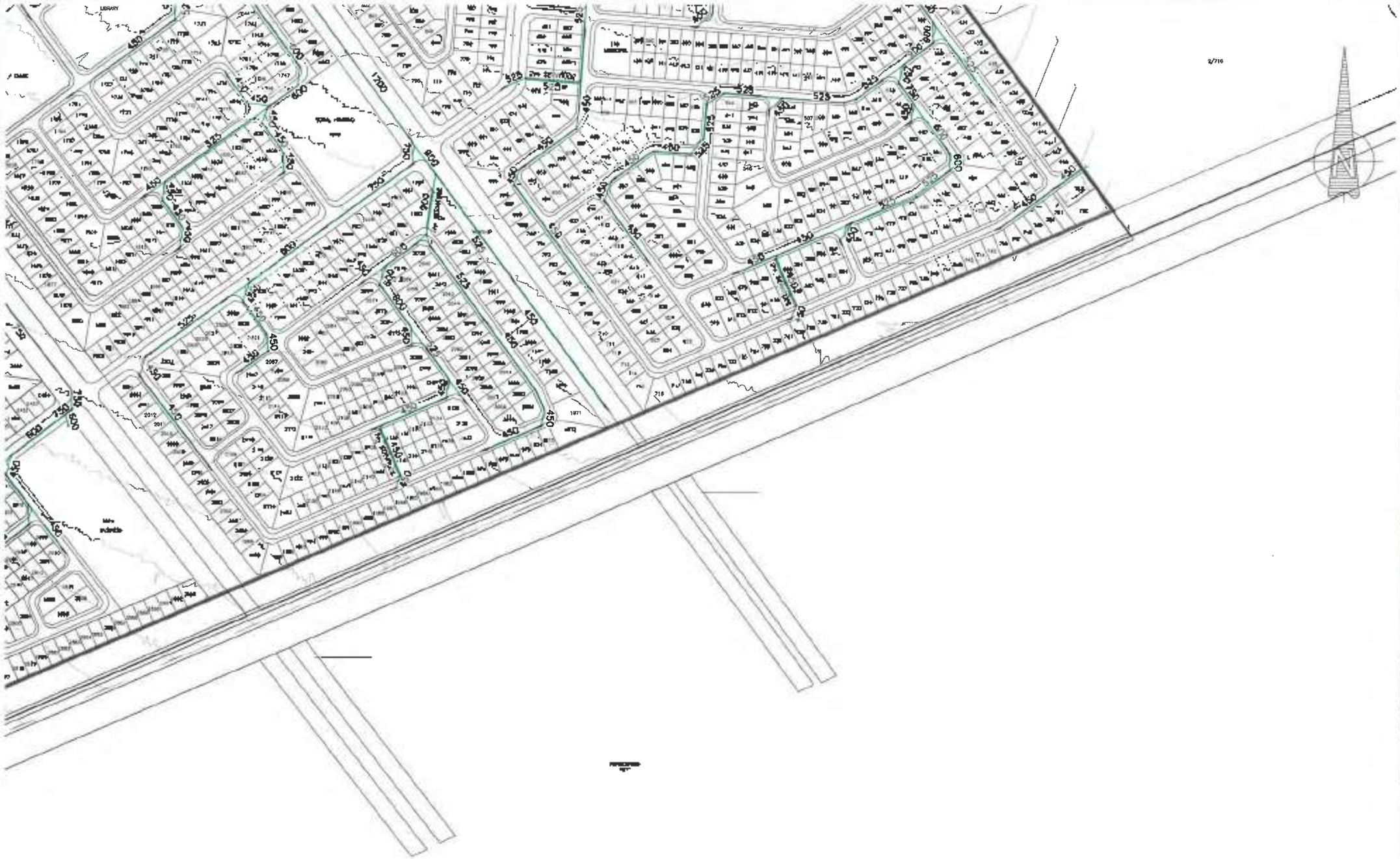
GENERAL LAYOUT: STORM WATER SHEET 4 OF 5

JULY 2020

1:2000

2698/500/04/00

2698/500/04/00



MANGAUNG METROPOLITAN MUNICIPALITY

NGOTI DEVELOPMENT CONSULTANTS

CIVILCONSULT
Consulting Engineers

L. WENTZEL

TOWNSHIP ESTABLISHMENT ON A PORTION OF THE REMAINDER OF THE FARM KLIPFONTEIN 916 AND FARM CERES 626 BLOEMFONTEIN

GENERAL LAYOUT:
STORM WATER
SHEET 5 OF 5

JULY 2020

1:2000

2698/500/05/00

2698/500/05/00

ANNEXURE D

RELEVANT CORRESPONDENCE FROM WATER AND SANITATION

Eben Terblanche

From:	Kopano K.D. Moshanyana <Kopano.Moshanyana@mangaung.co.za>
Sent:	11 June 2020 05:02 PM
To:	Mlondolozi Ndlovu; Luzuko Ntlabezo; Coen C. Bezuidenhout
Cc:	Eben Terblanche; Bheki S. Mthembu; fumanik@ngoti.co.za; Heinrich H. Arpin
Subject:	FW: Existing Services: A Portion Of The Farm Klipfontein 716 And Farm Ceres 626 BD
Attachments:	Masterplan Demands (Sewer) 13 May 2020.xlsx; Masterplan Demands (Water) 13 May 2020.xlsx; Masterplan Layout (Option 1 - Sewer).pdf; Masterplan Layout (Option 1 - Water).pdf; Masterplan Layout (Option 2).pdf; 064-2020_Final_Feedback Farm Klipfontein 716 And Farm Ceres 626 BD.PDF

Good day Sirs,

My discuss with Eben.

During the capacity analysis session and follow up meeting, we noted the following:

The development is **not currently forming part of the SDF**, which means the model or future plans for infrastructure does not incorporate this development.

Water model: There is a serious storage capacity problems. The current water infrastructure does not have sufficient storage. To address insufficient capacity problem in line with MMM Water Master plan. The most feasible Opt: was to construct another reservoir 45ML close to Longridge reservoirs or any other locations (which can be determine during concept and viability stage in order to supply the south of the SDF). The option will solve current and future water problems in the southern side of the City (based on the current SDF). I am also of an opinion that we need to spend more time in updating our SDF so as to plan properly.

Sewer model. The capacity of the current Sterkwater WWTW pipeline is insufficient. Although the treatment its self has sufficient capacity (i.e. if we fix the leaks within Sterkwater WWTW catchment area). As part of the project we requested the Consultant to upgrade the pipeline to Sterkwater WWTW.

I spoke to Ntate Fumani, who indicated to me that MMM: Planning is responsible for the project. We therefore need to address the funding component for these options in order to successfully implement the project.

Hope you find this in order.

Thank you

Kopano Moshanyana
First Engineer
Water and Sanitation
Mangaung Metropolitan Municipality
Email: *kopano.moshanyana@mangaung.co.za*

AT THE HEART OF IT ALL

From: Eben Terblanche [mailto:terblanche@civilconsult.co.za]
Sent: 11 June 2020 09:42 AM
To: Kopano K.D. Moshanyana
Cc: fumani@ngoti.co.za; Leon Wentzel; Civil Consult; Mlondolozi Ndlovu; Bheki S. Mthembu
Subject: RE: Existing Services: A Portion Of The Farm Klipfontein 716 And Farm Ceres 626 BD

Hi Kopano,

Hope to find you well.

Can you please provide us with feedback in this regard?

We look forward to your response.

Groete / Kind Regards

Eben Terblanche

Cell: +27 (0)78 236 8855
Tel: +27 (0)12-343 6297 / 0181 / 0845
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From: Eben Terblanche
Sent: 08 June 2020 07:33 AM
To: Kopano K.D. Moshanyana <Kopano.Moshanyana@mangaung.co.za>
Cc: fumani@ngoti.co.za; Leon Wentzel <wentzel@civilconsult.co.za>; Civil Consult <mail@civilconsult.co.za>; Mlondolozi Ndlovu <Mlondolozi.Ndlovu@mangaung.co.za>; Bheki S. Mthembu <Bheki.Mthembu@mangaung.co.za>
Subject: RE: Existing Services: A Portion Of The Farm Klipfontein 716 And Farm Ceres 626 BD

Hi Kopano,

Our Whatsapp conversation refers.

Can you please provide us feedback on the proposals as discussed?

WE need to finalise our Services Reports, and require confirmation on the water and sanitation department.

Looking forward to your response in this regard.

Groete / Kind Regards

Eben Terblanche

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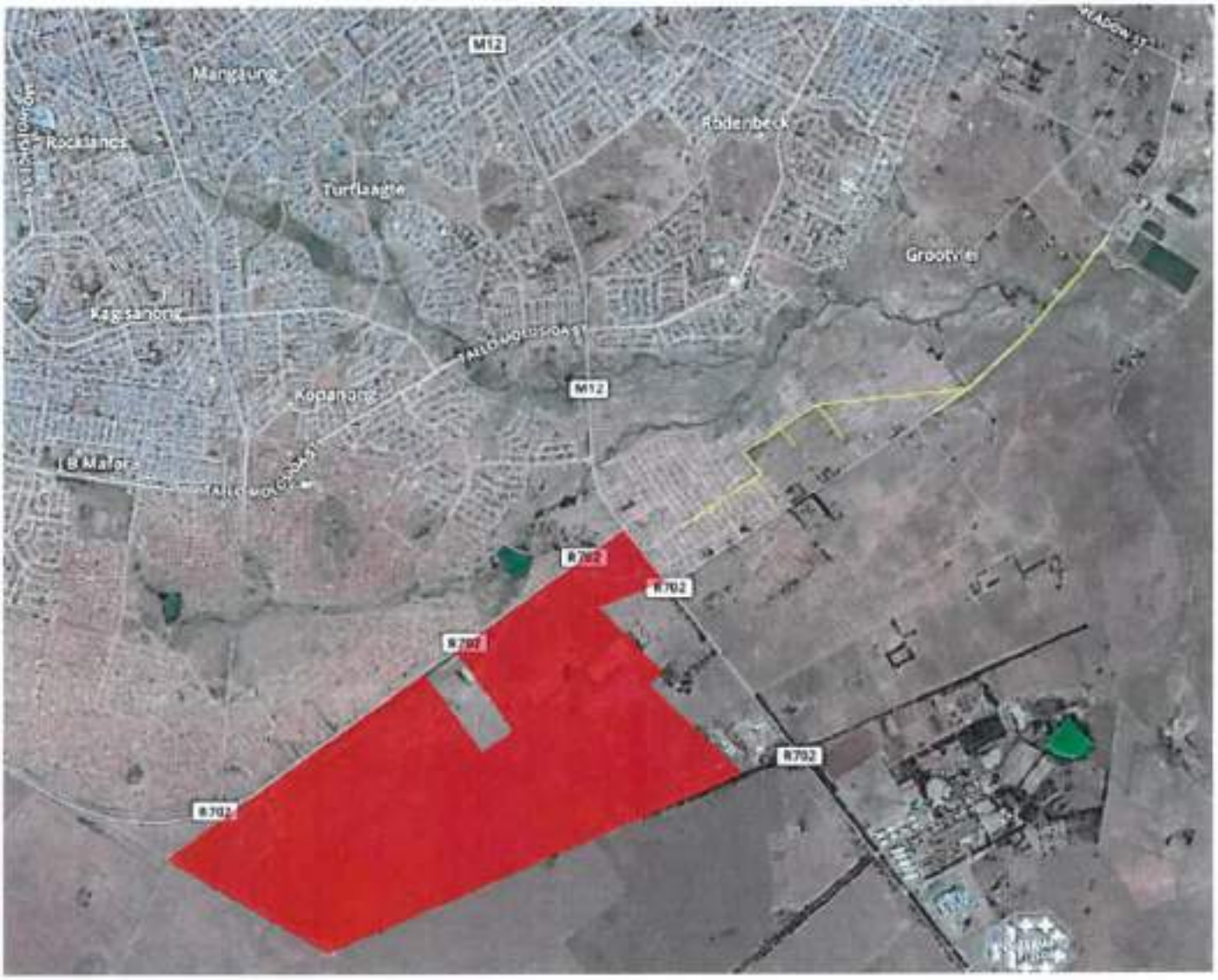
From: Kopano K.D. Moshanyana [mailto:Kopano.Moshanyana@mangaung.co.za]
Sent: 14 May 2020 11:56 AM
To: Eben Terblanche <terblanche@civilconsult.co.za>
Cc: fumani@ngoti.co.za; Leon Wentzel <wentzel@civilconsult.co.za>; Civil Consult <mail@civilconsult.co.za>; Mlondolozi Ndlovu <Mlondolozi.Ndlovu@mangaung.co.za>; Bheki S. Mthembu <Bheki.Mthembu@mangaung.co.za>
Subject: RE: Existing Services: A Portion Of The Farm Klipfontein 716 And Farm Ceres 626 RD

Hi Eben,

Attached is the GIS information regarding the planned sewer infrastructure in the vicinity of the development.

I propose that we have a separate meeting in which our concerns and your questions can be discussed.



Hope you find this in order.

Thank you

Kopano Moshanyana
First Engineer
Water and Sanitation
Mangaung Metropolitan Municipality
Email: kopano.moshanyana@mangaung.co.za

AT THE HEART OF IT ALL

From: Eben Terblanche [mailto:terblanche@civilconsult.co.za]
Sent: 13 May 2020 09:58 AM
To: Kopano K.D. Moshanyana; Christo.Potgieter@bigengroup.com
Cc: fumani@ngoti.co.za; Leon Wentzel; Civil Consult; Mlondolozi Ndlovu; Bheki S. Mthembu
Subject: RE: Existing Services: A Portion Of The Farm Klipfontein 716 And Farm Ceres 626 RD

Hi Kopano,

Hope to find you well.

Can you please send us the prelim route planned for the outfall sewer as requested below?

Thank you very much

Groete / Kind Regards

Eben Terblanche

Cell: +27 (0)78 238 8865
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From: Eben Terblanche
Sent: 11 May 2020 09:21 AM
To: 'Kopano K.D. Moshanyana' <Kopano.Moshanyana@mangaung.co.za>
Cc: fumani@ngoti.co.za; Leon Wentzel <wentzel@civilconsult.co.za>; Civil Consult <mail@civilconsult.co.za>; Mlondolozi Ndlovu <Mlondolozi.Ndlovu@mangaung.co.za>; Bheki S. Mthembu <Bheki.Mthembu@mangaung.co.za>
Subject: RE: Existing Services: A Portion Of The Farm Klipfontein 716 And Farm Ceres 626 RD

Hi Kopano,

Thank you very much for your help in this regard.

Regarding the recommendations and conclusions:

Water:

MMM Feedback: Since this development does not form part of the MMM SDF, no water infrastructure is planned to accommodate development in this area.

MMM Feedback: The developer's civil engineer should further investigate and propose different options to MMM: Engineering Services through which the development can be accommodated in terms of bulk storage and a new water network. Options to be investigated should also include possible connection to the Water Service Provider's bulk pipeline close to the development.

1. Can you please indicate to which pipeline you would **prefer** us to connect to? There is an existing 1050mmØ, 300mmØ, 610mmØ and 90mmØ.
2. We will do the investigations, and propose a solution.

Sanitation:

MMM Feedback: The planned future capacity of the Sterkwater WWTW will not be sufficient to accommodate the development's wastewater effluent . Since this development is not included in the latest MMM SDF, the planned future sewer outfall pipeline in the vicinity (as proposed in the Bloemfontein Sewer Masterplan) will not have sufficient capacity to accommodate the development.

1. Can you please forward us the proposed route and size of this outfall sewer pipeline as indicated in the Sewer Master Plan? We would like to investigate the route as well as the capacity required.

MMM Feedback: The developer's civil engineer should further investigate and propose different options to MMM: Engineering Services through which the development's wastewater can be accommodated. The developer should ensure that the proposed outfall sewer pipeline to be constructed for this development makes provision for all developments that could gravitate towards the proposed pipeline in accordance with MMM's latest SDF and Sewer Masterplan (2019).

1. Would it be possible to forward us the Water and Sewer Masterplans for the area? We will try and align the upgrades as far as possible in accordance with the Masterplans..
2. If you could include the drawings of the proposals, it would be much appreciated.

We look forward to your response in this regard.

Groete / Kind Regards

Eben Terblanche

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From: Kopano K.D. Moshanyana [mailto:Kopano.Moshanyana@mangaung.co.za]
Sent: 11 May 2020 08:58 AM
To: Eben Terblanche <terblanche@civilconsult.co.za>
Cc: fumani@ngoti.co.za; Leon Wentzel <wentzel@civilconsult.co.za>; Civil Consult <mail@civilconsult.co.za>; Mlondolozi Ndlovu <Mlondolozi.Ndlovu@mangaung.co.za>; Bheki S. Mthembu <Bheki.Mthembu@mangaung.co.za>
Subject: RE: Existing Services: A Portion Of The Farm Klipfontein 716 And Farm Ceres 626 BD

Morning Eben,

Attached herein please find capacity analysis feedback for Portion of farm Klipfontein 716 and Farm Ceres 626.

Hope you find this in order.

Thank you

Kopano Moshanyana
First Engineer
Water and Sanitation
Mangaung Metropolitan Municipality
Email: *kopano.moshanyana@mangaung.co.za*

AT THE HEART OF IT ALL

From: Kopano K.D. Moshanyana
Sent: 06 May 2020 12:37 PM
To: 'Eben Terblanche'
Cc: fumani@ngoti.co.za; Leon Wentzel; Civil Consult
Subject: RE: Existing Services: A Portion Of The Farm Klipfontein 716 And Farm Ceres 626 BD

Hi Eben,

Still busy analysing. I will revert back to you not later than next week Tuesday.

Thank you

Kopano Moshanyana
First Engineer
Water and Sanitation
Mangaung Metropolitan Municipality
Email: *kopano.moshanyana@mangaung.co.za*

AT THE HEART OF IT ALL

From: Eben Terblanche [mailto:terblanche@civilconsult.co.za]
Sent: 04 May 2020 10:13 AM
To: Kopano K.D. Moshanyana
Cc: fumani@ngoti.co.za; Leon Wentzel; Civil Consult
Subject: RE: Existing Services: A Portion Of The Farm Klipfontein 716 And Farm Ceres 626 BD

Hi Kopano,

Hope to find you well.

The information as supplied, is it sufficient, or is there any additional info that you require?

We would like to submit the Services Report as soon as possible?

Looking forward to your response in this regard.

Groete / Kind Regards

Eben Terblanche

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From: Eben Terblanche
Sent: 28 April 2020 11:52 AM
To: Kopano K.D. Moshanyana <Kopano.Moshanyana@mangaung.co.za>
Cc: Coen C. Bezuidenhout <Coen.Bezuidenhout@mangaung.co.za>; Mlondolozi Ndlovu <Mlondolozi.Ndlovu@mangaung.co.za>; Fumani Mathebula <fnmathebula@gmail.com>; fumani@ngoti.co.za; Leon Wentzel <wentzel@civilconsult.co.za>; Civil Consult <mail@civilconsult.co.za>
Subject: RE: Existing Services: A Portion Of The Farm Klipfontein 716 And Farm Ceres 626 RD

Good day Kopano,

Hope to find you well.

Thank you very much for your quick response in this regard.

Please see attached the form, as well as a layout plan for the Proposed Development.

Please feel free to contact us if there is anything that you might require from us additionally.

Groete / Kind Regards

Eben Terblanche

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From: Kopano K.D. Moshanyana [mailto:Kopano.Moshanyana@mangaung.co.za]
Sent: 27 April 2020 11:34 PM
To: Eben Terblanche <terblanche@civilconsult.co.za>
Cc: Coen C. Bezuidenhout <Coen.Bezuidenhout@mangaung.co.za>; Mlondolozi Ndlovu <Mlondolozi.Ndlovu@mangaung.co.za>
Subject: RE: Existing Services: A Portion Of The Farm Klipfontein 716 And Farm Ceres 626 RD

Good evening

Attached here in is the capacity analysis request form.

Will you please fill the form for water and sanitation feedback purpose.

Hope you find this in order.

Thank you

Kopano Moshanyana
First Engineer
Water and Sanitation
Mangaung Metropolitan Municipality
Email: kopano.moshanyana@mangaung.co.za

AT THE HEART OF IT ALL

From: Mlondolozi Ndlovu
Sent: 24 April 2020 12:23 PM
To: Heinrich H. Arpin; Coen C. Bezuidenhout; Kopano K.D. Moshanyana; Luzuko Ntlabezo; Revelation I. Masobeng
Subject: FW: Existing Services: A Portion Of The Farm Klipfontein 716 And Farm Ceres 626 BD

FYA

From: Bheki S. Mthembu <BhekiMthembu@mangaung.co.za>
Sent: Friday, April 24, 2020 11:45 AM
To: Fumani Mathebula <fumani@ngotidc.co.za>
Cc: Jupiter Phaladi <Jupiter.Phaladi@mangaung.co.za>; Mlondolozi Ndlovu <MlondoloziNdlovu@mangaung.co.za>
Subject: RE: Existing Services: A Portion Of The Farm Klipfontein 716 And Farm Ceres 626 BD

Dear Mr Mathebula

Can you in meantime prepare a quick report of the progress on all studies in the following table for better detailed reporting by HoD Human Settlements. Can I get
the report by Monday 27 April 2020

Item	Study Description	Issued to/being evaluated by (where applicable)	Progress to date	Proposed Completion Date
1	Roads and Stormwater Report	?? of Engineering		
2	Water and Sanitation Report	?? of Engineering		
3	Electricity Report	?? of CENTLEC		
4	Environment Impact Assessment Report	?? of DESTEA		
5	Traffic Impact Study Report	?? of MMM, Provincial Road and SANRAL		

6	etc			
7	Planned submission of complete report to MMM	Planning Department	Not Yet submitted	Refer to Process Plan

Regards

HoD Planning

From: Bheki S. Mthembu
Sent: Friday, 24 April 2020 10:52
To: Fumani Mathebula <fumani@ngotidc.co.za>
Subject: RE: Existing Services: A Portion Of The Farm Klipfontein 716 And Farm Ceres 626 BD

Dear Mr Mathebula

In meantime please send me the same report or email with attached engineering report that was sent to Kele so that I will forward to Mr Ndlovu (Engineering HoD)

Regards

Bheki Mthembu

From: Fumani Mathebula <fumani@ngotidc.co.za>
Sent: Friday, 24 April 2020 10:32
To: Bheki S. Mthembu <Bheki.Mthembu@mangaung.co.za>
Subject: FW: Existing Services: A Portion Of The Farm Klipfontein 716 And Farm Ceres 626 BD

Hi Mr Mthembu

Please email below. Our civil engineers have contacted Kelebogile Wolf on the below email for the Klipfotein project and to date she has not replied. Please intervene so we fast track the finalization of reports.

kelebogile Wolf <kelebogile.Wolf@mangaung.co.za>

From: Eben Terblanche [mailto:terblanche@civilconsult.co.za]
Sent: Friday, April 24, 2020 08:10 AM
To: kelebogile Wolf <kelebogile.Wolf@mangaung.co.za>
Cc: Leon Wentzel <wentzel@civilconsult.co.za>; Civil Consult <mail@civilconsult.co.za>; Christiaan Peens <peens@civilconsult.co.za>; Ruan Beukes <beukes@civilconsult.co.za>; Fumani Mathebula <fmmathebula@gmail.com>
Subject: RE: Existing Services: A Portion Of The Farm Klipfontein 716 And Farm Ceres 626 BD

Hi Kele,

Hope to find you well, and that you are still keeping safe?

Did you have a chance to look at the emails below?

Looking forward to your response in this regard.

Groete / Kind Regards

Eben Terblanche

Cell: +27 (0)78 238 8855

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From: Eben Terblanche
Sent: 22 April 2020 10:56 AM
To: kelebogile Wolf <kelebogile.Wolf@mangaung.co.za>
Cc: Leon Wentzel <wentzel@civilconsult.co.za>; Civil Consult <mail@civilconsult.co.za>; Christiaan Peens <peens@civilconsult.co.za>; Ruan Beukes <beukes@civilconsult.co.za>; Fumani Mathebula <fnmathebula@gmail.com>
Subject: RE: Existing Services: A Portion Of The Farm Klipfontein 716 And Farm Ceres 626 RD

Hi Kele,

Hope to find you well.

Did you perhaps have a chance to look at our request below?

We look forward to your response in this regard.

Groete / Kind Regards

Eben Terblanche

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From: Eben Terblanche
Sent: 16 April 2020 11:32 PM
To: 'kelebogile Wolf' <kelebogile.Wolf@mangaung.co.za>
Cc: Leon Wentzel <wentzel@civilconsult.co.za>; Civil Consult <mail@civilconsult.co.za>; Christiaan Peens <peens@civilconsult.co.za>; Ruan Beukes <beukes@civilconsult.co.za>
Subject: RE: Existing Services: A Portion Of The Farm Klipfontein 716 And Farm Ceres 626 BD

Hi Kele,

Hope to find you well, and that you are still keeping safe!!

Please see the revised layout for the above mentioned property.

The site was affected by future road planning as well as flood lines which affected the layout.

Please see below the estimated water and sewer demands:

Water:

Zoning	Proposed Development		
	Floor Area / No. of units / Hectare	Average Annual Daily Demand (AADD)	Water Demand (kℓ/d)
Residential 1 (50 units/ha)	6 560.00 Stands	0.8kℓ/d/unit	5248.00
Residential 2 (75 units/ha)	330.00 Units	0.8kℓ/d/unit	264.00
Business 1	23 100.00 m²	0.4kℓ/d/100m²	92.40
Place of Worship	3 500.00 m²	0.4kℓ/d/100m²	14.00
Municipal	1 600.00 m²	0.4kℓ/d/100m²	6.40

Community Facility	2 100.00 m²	0.4kℓ/d/100m²	8.40
Health Centre	8 400.00 m²	0.5kℓ/d/100m²	42.00
Library	5 600.00 m²	0.4kℓ/d/100m²	22.40
Police Station	8 400.00 m²	0.4kℓ/d/100m²	33.60
Primary School	4.20 ha	12.50kℓ/d/ha	52.50
Combined School	7.40 ha	12.50kℓ/d/ha	92.50
Crèche	0.40 ha	12.50kℓ/d/ha	5.00
Sports Field	1.90 ha	15.00kℓ/d/ha	28.50
Public Open Space	12.60 ha	12.00kℓ/d/ha	151.20
Streets	53.80 ha	-	-
Total			**6060.90**

Sewer:

Zoning	Proposed Development		
	Floor Area / No. of units / Hectare	Average Annual Daily Flow (AADF)	Sewerage Flow (kℓ/d)
Residential 1 (50 units/ha)	6 560.00 Stands	0.6kℓ/d/unit	3936.00
Residential 2 (75 units/ha)	330.00 Units	0.6kℓ/d/unit	198.00
Business 1	23 100.00 m²	0.32kℓ/d/100m²	73.92
Place of Worship	3 500.00 m²	0.32kℓ/d/100m²	11.20
Municipal	1 600.00 m²	0.32kℓ/d/100m²	5.12
Community Facility	2 100.00 m²	0.32kℓ/d/100m²	6.72
Health Centre	8 400.00 m²	0.40kℓ/d/100m²	33.60
Library	5 600.00 m²	0.32kℓ/d/100m²	17.92
Police Station	8 400.00 m²	0.32kℓ/d/100m²	25.20
Primary School	4.20 ha	8.13kℓ/d/ha	34.15
Combined School	7.40 ha	8.13kℓ/d/ha	60.16
Crèche	0.40 ha	8.13kℓ/d/ha	3.25
Sports Field	1.90 ha	6.00kℓ/d/ha	11.40

Public Open Space	12.60 ha	-	-
Streets	53.80 ha	-	-
Total			**4416.64**

Can you please indicate if where we can connect to existing water and sewer infrastructure in order to service our development? Will there be sufficient capacity available?

When we were ons site during 2019 in August, we noticed that there is a new water pipeline being construction on the south-western boundary of the Proposed Development. Has this pipeline in the meantime been commissioned? Will we be able to tie into this water pipeline for our development?

Looking forward to your response in this regard.

Groete / Kind Regards

Eben Terblanche

Cell: +27 (0)78 238 8855
Tel: +27 (0)12-343 6297 / 0181 / 0845
Fax: +27 (0)12-343 8929 / 086 583 6249
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From: kelebogile Wolf [mailto:kelebogile.Wolf@mangaung.co.za]
Sent: 09 July 2019 08:45 AM
To: Eben Terblanche <terblanche@civilconsult.co.za>
Cc: Leon Wentzel <wentzel@civilconsult.co.za>; Civil Consult <mail@civilconsult.co.za>; Christiaan Peens <peens@civilconsult.co.za>; Ruan Beukes <beukes@civilconsult.co.za>
Subject: RE: Existing Services: A Portion Of The Farm Klipfontein 716 And Farm Ceres 626 RD

Good day,

Please see the attached existing services plans and the analysis request form to fill and return back to me.

A copy of the latest masterplan is available but cannot be send by email due to the size of the document but there's an email from Christo summing up the network status quo.

Regards,
Kele Wolf

Engineering Services- Water and Sanitation

☎ +(27) 51 410 6763 | ✉ kelebogile.Wolf@mangaung.co.za | 🌐 www.mangaung.com

PO Box 3704
Bloemfontein
9300

MANGAUNG
Metro Municipality
Mmele Mangaung
Lekgotla la Metse

AT THE HEART OF IT ALL

Please consider the environment before printing this email

From: Eben Terblanche [mailto:terblanche@civilconsult.co.za]
Sent: Thursday, July 4, 2019 7:46 AM
To: kelebogile Wolf
Cc: Leon Wentzel; Civil Consult; Christiaan Peens; Ruan Beukes
Subject: RE: Existing Services: A Portion Of The Farm Klipfontein 716 And Farm Ceres 626 RD

Hi Kele,

Hope to find you well.

Any feedback on the request below?

Groete,

Eben Terblanche

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From: Eben Terblanche
Sent: 27 June 2019 02:41 PM
To: 'kelebogile Wolf' <kelebogile.Wolf@mangaung.co.za>
Cc: Leon Wentzel <wentzel@civilconsult.co.za>; Civil Consult <mail@civilconsult.co.za>; Christiaan Peens <peens@civilconsult.co.za>; Ruan Beukes <beukes@civilconsult.co.za>
Subject: Existing Services: A Portion Of The Farm Klipfontein 716 And Farm Ceres 626 BD

Good day Kele,

Hope to find you well.

Please see attached the proposed site development plan for a proposed development located on a Portion of The Farm Klipfontein 716 and Farm Ceres 626 BD

Could you kindly provide us with the existing water & sewer services located within the vicinity of the area referred to in below image? Could you also include any relevant As-Built information with regards to these existing services.

If you have a water & sewer masterplan for the area, can you please also forward us the masterplans?

Thank you very much for your assistance in this regard.

Groete.

Eben Terblanche

Cell: +27 (0)78 238 8855
Tel: +27 (0)12-343 6297 / 0181 / 0845

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WATER AND SEWER INFRASTRUCTURE CAPACITY ANALYSIS REQUEST

MANGAUNG

Request No (For Office Use Only):	064/2020
Application By (Developer's Civil Engineer):	CIVILCONSULT Consulting Engineers
Developer:	NGOTI DEVELOPMENT CONSULTANTS
Development Name:	FUMANI MATHEBULA
Date:	28/04/2020
Street Address of Development:	R702
Erf/Holding/Farm Number:	FARM KLIPFONTEIN 716
Current Zoning of Property:	Other
Type of Development (New or Re-Zoning):	New Development
Future Zoning of Property:	Other
Planned Construction Commencement Date:	NOT AVAILABLE AT THIS STAGE
Date of Development's Connection to Municipal Network:	AS SOON AS POSSIBLE
If Residential, Number of Units:	

Short Description of the Type and Extent of Development:

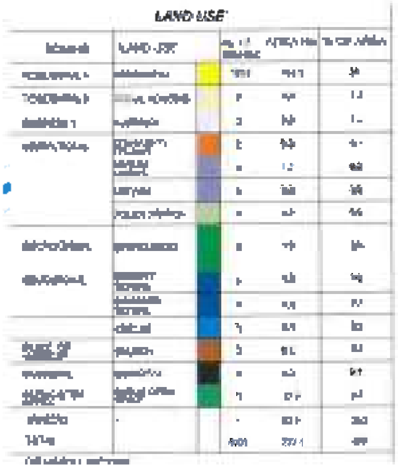
Please attach full rights and uses of existing and new development.

PLEASE REFER TO SCHEDULE OF RIGHTS BELOW AND ATTACHED

Is the development in accordance with the Mangaung Metropolitan Municipality's latest Spatial Development Framework (SDF)?	Yes
Does the development fall within the latest Urban Edge of Bloemfontein?	Yes

Development Location:

Insert an image which clearly indicates the location of the development. The property boundaries should be clearly outlined in the image and the image should be orientated globally North with North on top.



Existing Services and Connection Points:

Developer's consultants must please indicate on the plan (diagram) where they are planning to connect. Where a new line(s) will have to be provided, the proposed position of the line(s) must be indicated. If more than one option is available, it must be indicated. For that purpose consultants will have to indicate the position of existing services as obtained from MMM's Drawing Office.

The Developer's consultants is required to indicate the accurate position of the fire hydrants in the diagram below. If it's not obtainable from the MMM's Drawing Offices it will be required to survey the area for fire hydrants.

DEVELOPMENT SPECIFICS (Current Single Serviced Stands)		
	Maximum Floor Area Allowed on Site (m²):	
NO DEVELOPMENT CURRENTLY – FARM PORTION Current Property Information:	Stand Size (m²):	
	No. of Bathrooms / Showers:	
	No. of Toilets:	
PLEASE REFER TO SCHEDULE OF RIGHTS ATTACHED Future Development Information:	Total No. of Bathrooms / Showers:	
	Total No. of Toilets:	
	Total Roof Area (m²):	

WATER CONTRIBUTION		
Water Demand		
Annual Average Daily Demand:	(kℓ/day)	6060.90
Peak Flow Factor for Type of Development:		3.3
Peak Demand:	(ℓ/s)	70.15 l/s X 3.3 = 231.50
Fire Flow		
Current Fire Risk Category of Property:		
Proposed Fire Risk Category after Development:		
Fire Flow:	(ℓ/s)	25

*All numerical values must be in accordance with the SI system.

Planned on-site bulk water storage (Yes / No):		No
If Yes, indicate volume:	(kℓ)	

Notes on Water Demand Information:
Water and fire flow demands calculated should be based on the recommended demand information as per The Neighbourhood Planning And Design Guide (Red Book): Creating Sustainable Human Settlements (2019)

SEWER CONTRIBUTION		
Sewer Yield		
Average Dry Weather Flow (ADWF):	(kℓ/day)	4416.64
Peak Factor for Type of Development:		2.5
Peak Dry Weather Flow (PDWF):	(ℓ/s)	5.11 l/s x 2.5 = 12.78

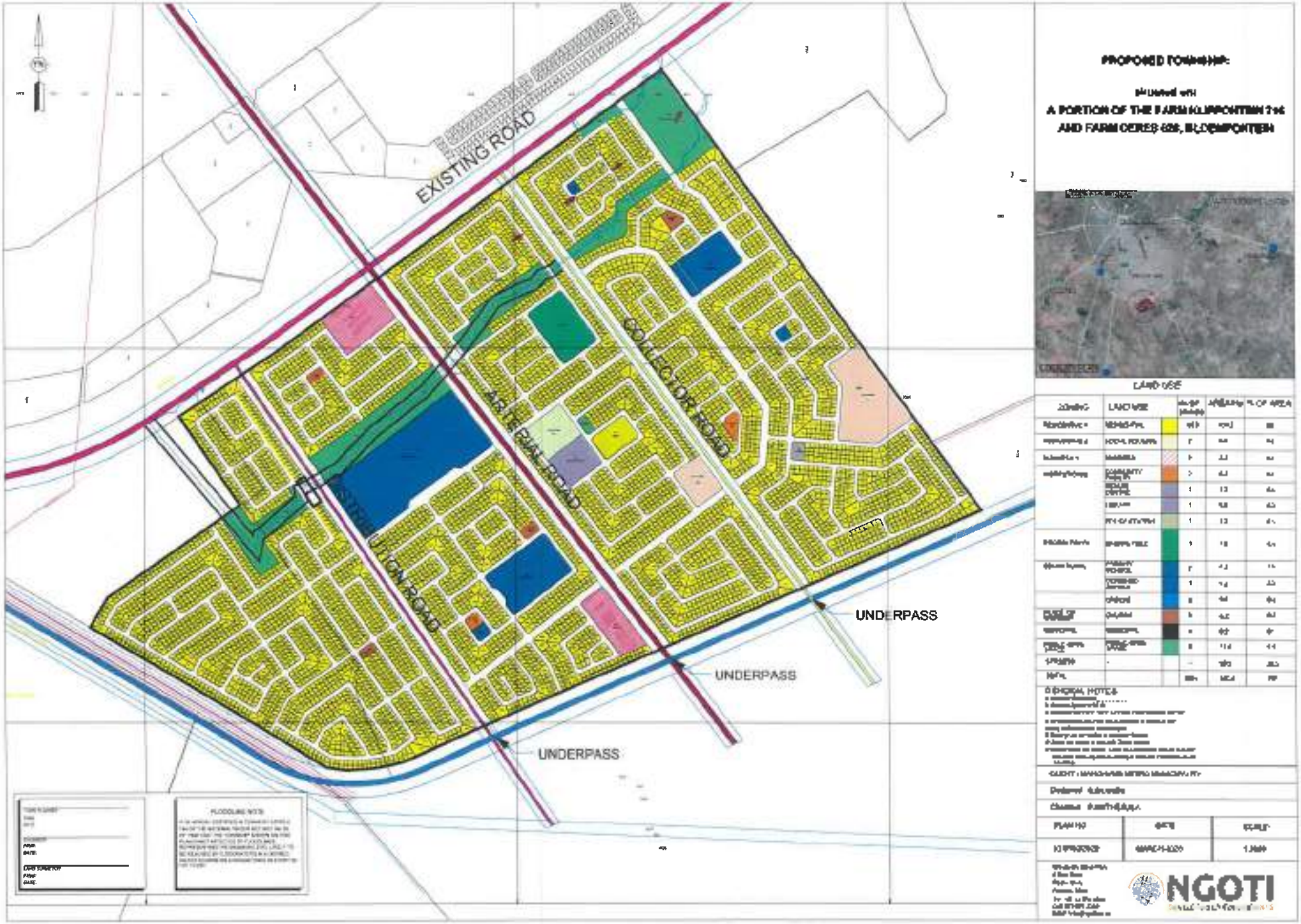
*All numerical values must be in accordance with the SI system.

Notes on Sewer Yield Information:
Sewerage effluent flows calculated should be based on the recommended effluent information as per The Neighbourhood Planning And Design Guide (Red Book): Creating Sustainable Human Settlements (2019).

Requested by:	L. WENTZEL
On behalf of:	NGOTI DEV
Signed (Pr. Eng):	Pr No. 950052
Date:	28/04/2020

For Office Use Only	
Approved by:	Kotaro Moshanyama
On behalf of:	MMM
Signed:	
Date:	

IMPORTANT NOTICE: Incomplete or unsigned forms will cause delays for which the Developer will ultimately be held accountable for.


EXISTING ROAD
COLLECTOR ROAD
ARTERIAL ROAD
UNION ROAD
UNDERPASS
UNDERPASS
UNDERPASS
FLOODLINE NOTE
LAND USE

WATER INFRASTRUCTURE CAPACITY ANALYSIS RESPONSE

MANGAUNG

1) Application details	Request No:	064/2020
Is this a revision to a previous request based on additional information received?		No
Zoning Applied for:		Mixed Use
Future SDF Zoning:		Not part of MMM SDF
Additional information:		

2) Bulk Reservoir Supply Zone	Current:	None
	Future:	To be planned

3) Storage Capacity

Existing Storage Capacity	None	
Existing Reservoir Theoretical Backup Storage Time:	-	hours
Does planned infrastructure accommodate this development?	No	

Conclusion: A new reservoir to provide the development's minimum water storage requirements needs to be constructed (to be investigated in more detail by the developer's civil engineer).

4) Operating Pressure

Distribution Network Capacity:	None		
Status Quo Theoretical Operating Pressure at Ground Elevation Level:	Static	N/A	m
	Minimum	N/A	m
Future Predicted Operating Pressure at Ground Elevation Level:	Static	N/A	m
	Minimum	N/A	m

Conclusion: The Longridge and Rodenbeck distribution network (closest distribution zones to the development) was not designed to accommodate development in this area. Since this development does not form part of the MMM SDF, no water infrastructure is planned to accommodate development in this area.

5) Fire Flow Pressure

Current Fire Flow Pressure:	Minimum:	N/A	m
Does planned infrastructure accommodate this development?	No		

Conclusion: Since this development does not form part of the MMM SDF, no water infrastructure is planned to accommodate development in this area.

6) Recommendation

For the developer: The developer's civil engineer should further investigate and propose different options to MMM Engineering Services through which the development can be accommodated in terms of bulk storage and a new water network. Options to be investigated should also include possible connection to the Water Service Provider's bulk pipeline close to the development.

For MMM: MMM to revise the SDF to include the development and include the development in the Bloemfontein Internal Water Masterplan.

Request No (Admin): 064/2020

SEWER INFRASTRUCTURE CAPACITY ANALYSIS RESPONSE

MANGAUNG

Request No: 064/2020

1) Waste Water Treatment Works (WWTW)

Catchment Area	Sterkwater WWTW
Theoretical Status Quo Capacity:	Sufficient
Future Predicted Capacity:	Insufficient

2) Sewer Network Capacity

Existing Infrastructure Available for the Development	No
Does the preliminary Sewer Masterplan (2019) accommodate planning in this area?	No
Theoretical Status Quo Capacity:	N/A
Future Predicted Capacity:	N/A

Conclusion: The planned future capacity of the Sterkwater WWTW will not be sufficient to accommodate the development's wastewater effluent . Since this development is not included in the latest MMM SDF the planned future sewer outfall pipeline in the vicinity (as proposed in the Bloemfontein Sewer Masterplan) will not have sufficient capacity to accommodate the development.

Figure

3) Recommendation

The developer's civil engineer should further investigate and propose different options to MMM: Engineering Services through which the development's wastewater can be accommodated. The developer should ensure that the proposed outfall sewer pipeline to be constructed for this development makes provision for all developments that could gravitate towards the proposed pipeline in accordance with MMM's latest SDF and Sewer Masterplan (2019).

4) Report Status

Additional Information Requested:	No
Additional Information Received:	No
Report Status	Finalised

Mr C Pohlmeier (Pr Eng)

11 May 2020

Date

Notes:
1) The conclusions and recommendations above will not prevent the development to proceed. The information will merely inform municipal infrastructure upgrades to accommodate the development.
2) Where it appears that existing infrastructure does not have sufficient capacity to accommodate the development based on current information, additional information will be requested in order to finalise the conclusion and recommendation of the capacity analysis.
3) Should further network investigations be recommended, this analysis will only be considered further upon submission of results from recommended investigations.
4) This analysis response is valid for a period of 3 years from date of issue. Should the development be delayed, reapplication will be required.

Request No (Admin): 064/2020

CIVILCONSULT
Consulting Engineers

21 January 2020 **Our Ref : 2698**

Centlec – Mangaung Metropolitan Municipality
125 Nelson Mandela Drive
College Square
Telkom Building

Attention : Mr Kobus Booysen

TOWNSHIP ESTABLISHMENT ON A PORTION OF THE FARM KLIPFONTEIN 716 AND FARM CERES 626, BLOEMFONTEIN : APPLICATON FOR ELECTRICITY SUPPLY

1. The proposed Bloemfontein Development is located on a Portion of the Farm Klipfontein 716 and Farm Ceres 626.

2. The estimated maximum demand of the proposed development is shown in the table below.

Zoning	Proposed Development		
	Floor Area (m²) / No. of Units	Unit Load Assumption (kVA / unit) (VA / m²)	Load (kVA)
Residential 1 (50 units/ha)	6 555 units	2	13 110.0
Residential 2 (75 units/ha)	255	1.8	459.0
Business 1	16 100	60VA/m²	966.0
Place of Worship	4 200	80VA/m²	336.0
Municipal	1 600	80VA/m²	128.0
Community Facility	2 100	60VA/m²	126.0
Health Centre	4 200	80VA/m²	336.0
Library	4 900	60VA/m²	294.0
Police Station	6 300	80VA/m²	504.0
Sports Centre	8 400	80VA/m²	672.0
Primary School	42 000	20VA/m²	840.0
Combined School	57 400.00	20VA/m²	1 148.0
Crèche	1 400.00	20VA/m²	28.0

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Tel +27 12 343 0845
Fax +27 12 343 6929
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SUNNYSIDE, Pretoria

PO Box 12645
HATFIELD
South Africa
0028

E-mail
mail@civilconsult.co.za

Directors
L Wentzel Pr Eng
LV Mitton

Shareholders
L Wentzel
LV Mitton

Sports Field	10 000.00	40VA/m²	400.0
Total (before Diversity)			19 347.0
Total (after Diversity)			16 477.8

3. We hereby formally apply for a capacity of 16MVA (after diversity). Your feedback in this regard will be appreciated.

4. Attached to this letter, please find a locality plan of the proposed development on a Portion of the Farm Klipfontein 716 and Farm Ceres 626 Development.

You are welcome to contact us should you require any further information.

Yours faithfully

Nico van der Merwe
for CIVILCONSULT Consulting Engineers (Pty) Ltd

ANNEXURE E

RELEVANT CORRESPONDENCE FROM ROADS AND STORM WATER

Eben Terblanche

From: Heinrich H. Arpin <Heinrich.Arpin@mangaung.co.za>
Sent: 23 July 2019 10:02 AM
To: Eben Terblanche
Subject: RE: Existing Services: A Portion Of The Farm Klipfontein 716 And Farm Ceres 626 BD

Eben

As was indicated, the proposed development falls outside our current masterplan, so yes, it must form part of your services report.

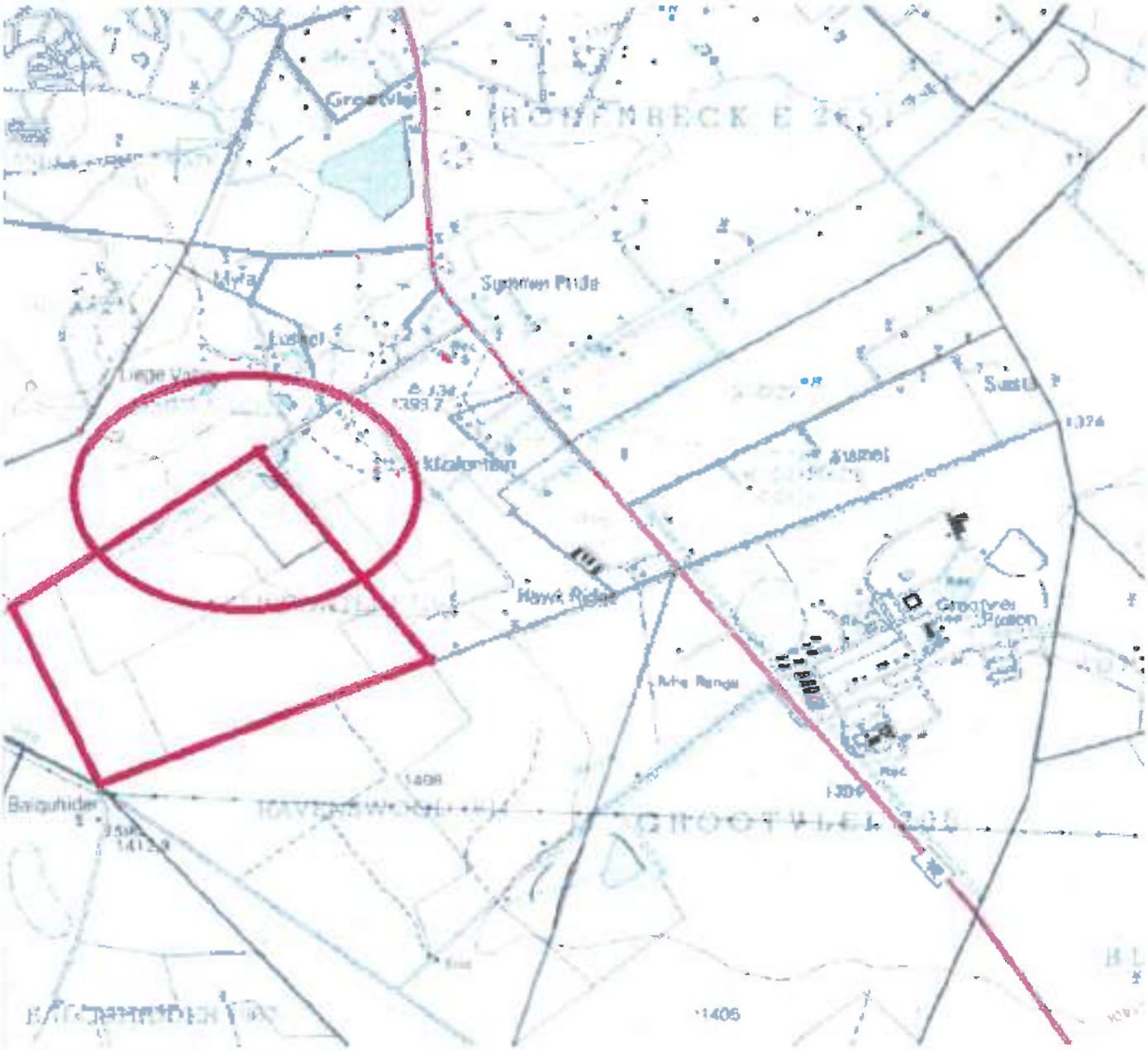
Regards
Hein

From: Eben Terblanche [mailto:terblanche@civilconsult.co.za]
Sent: 22 July 2019 07:51 AM
To: Heinrich H. Arpin <Heinrich.Arpin@mangaung.co.za>
Subject: RE: Existing Services: A Portion Of The Farm Klipfontein 716 And Farm Ceres 626 BD

Hi Heinrich,

Hope to find you well.

Please see an extract from the 1:50 000 maps:



There seems to be a spruit passing through the Proposed Development.

Should we do a flood line analysis and certify the flood line?

We look forward to your response in this regard.

Groete,

Eben Terblanche

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From: Heinrich H. Arpin [mailto:Heinrich.Arpin@mangaung.co.za]
Sent: 01 July 2019 12:07 PM
To: Eben Terblanche <terblanche@civilconsult.co.za>
Subject: RE: Existing Services: A Portion Of The Farm Klipfontein 716 And Farm Ceres 626 BD

Eben

The Consultants is NEP but they are subbing for some other consultants as far as I know.

We are still waiting for Design drawings.

Regards
Hein

From: Eben Terblanche [mailto:terblanche@civilconsult.co.za]
Sent: 28 June 2019 12:37 PM
To: Heinrich H. Arpin <Heinrich.Arpin@mangaung.co.za>
Cc: Leon Wentzel <wentzel@civilconsult.co.za>; Civil Consult <mail@civilconsult.co.za>; Juan-Pierre Marx <marx@civilconsult.co.za>; Ruan Beukes <beukes@civilconsult.co.za>; Christiaan Peens <peens@civilconsult.co.za>
Subject: RE: Existing Services: A Portion Of The Farm Klipfontein 716 And Farm Ceres 626 BD

Hi Heinrich,

Thank you very much for your speedy response to our query below.

Can you please indicate who the engineering company is that is currently busy to the north of our Proposed Development? Then we will be able to contact them directly?

Much appreciated!!

Groete,

Eben Terblanche

Cell. +27 (0)78 238 8855
Tel: +27 (0)12-343 6297 / 0181 / 0846

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From: Heinrich H. Arpin [mailto:Heinrich.Arpin@mangaung.co.za]
Sent: 28 June 2019 09:53 AM
To: Eben Terblanche <terblanche@civilconsult.co.za>
Subject: RE: Existing Services: A Portion Of The Farm Klipfontein 716 And Farm Ceres 626 BD

Eben

Could you kindly provide us with the existing roads and storm water services located within the vicinity of the area referred to in below image? Could you also include any relevant As-Built information with regards to these existing services.

Roads: Road that this development will connect to belongs to Province, please contact them for further information on existing roads. You must take notice of the new southern to eastern bypass that SANRAL is planning and it may be that your development will be affected please contact SANRAL in this regard.

Stormwater: No existing stormwater in that area but natural flow will be applicable, you must take note that consultants was appointed to do Roads and Stormwater designs on the township above your area and that can affect your development, this project is been managed by our Housing Development Department.

If you have a roads and storm water masterplan for the area, can you please also forward us the masterplans?

This Development falls outside our current Masterplan and will have to be included. The development will be responsible to update the masterplan for its inclusion.

Regards
Hein

From: Eben Terblanche [mailto:terblanche@civilconsult.co.za]
Sent: 27 June 2019 02:57 PM

To: Heinrich H. Arpin <Heinrich.Arpin@mangaung.co.za>
Cc: Leon Wentzel <wentzel@civilconsult.co.za>; Civil Consult <mail@civilconsult.co.za>; Christiaan Peens <peens@civilconsult.co.za>; Ruan Beukes <beukes@civilconsult.co.za>
Subject: Existing Services: A Portion Of The Farm Klipfontein 716 And Farm Ceres 626 RD

Good day Heinrich,

Hope to find you well.

Please see attached the Proposed Site Development Plan for a Proposed Development located on a Portion of The Farm Klipfontein 716 and Farm Ceres 626 RD

Could you kindly provide us with the existing roads and storm water services located within the vicinity of the area referred to in below image? Could you also include any relevant As-Built information with regards to these existing services.

If you have a roads and storm water masterplan for the area, can you please also forward us the masterplans?

Thank you very much for your assistance in this regard.

Groete,

Eben Terblanche

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ANNEXURE F

STORM WATER RUN-OFF CALCULATIONS

RATIONAL METHOD

Description of catchment	Township Establishment on a Portion of the Farm Klipplontein 716 and Farm Ceres 626				
River detail	Post-Development Storm Water Run-Off				
Calculated by	E. Terblanche		Date	07/07/2020	
Physical characteristics					
Size of catchment (A)	2.49601	km²	Rainfall region	INLAND	
Longest watercourse (L)	2.068	km	**Area distribution factors**		
Average slope (S_{av})	0.009913	m/m	Rural (α)	Urban (β)	Lakes (γ)
Dolomitic area (D_a)	0	%	0%	100%	0%
Mean annual rainfall (MAR)	519	mm			
Surface roughness coefficient (r)	0.02				

Rural (C_1)				**Urban (C_2)**			
Surface slope	%	**Factor**	C_s	**Description**	%	**Factor**	C_2
Vleis and pans	0	0.05	0.00	**Lawns**			
Flat areas	0	0.03	0.00	Sandy, flat (<2%)	0	0.1	0
Hilly	0	0.16	0.00	Sandy, steep (>7%)	0	0.2	0
Steep areas	0	0.26	0.00	Heavy soil, flat (<2%)	0	0.17	0
Total	0	-	0.00	Heavy soil, steep (<7%)	0	0.35	0
Permeability	%	**Factor**	C_p	**Residential areas**			
Very permeable	0	0.04	0.00	Houses	30	0.5	0.15
Permeable	0	0.08	0.00	Flats	0	0.7	0
Semi-permeable	0	0.16	0.00	**Industry**			
Impermeable	0	0.26	0.00	Light industry	10	0.8	0.08
Total	0	-	0.00	Heavy industry	0	0.8	0
Vegetation	%	**Factor**	C_v	**Business**			
Thick bush and plantation	0	0.04	0.00	City centre	0	0.7	0
Light bush and farm-lands	0	0.11	0.00	Suburban	0	0.7	0
Grass lands	0	0.21	0.00	Streets	60	0.95	0.57
No vegetation	0	0.28	0.00	Maximum flood	0	1	0
Total	0	-	0.00	Total (C_2)	100	-	0.8

Time of concentration (T_c)

Notes

Overland Flow	Defined watercourse
$T_c = 0{,}604\left(\frac{rL}{\sqrt{S_{av}}}\right)^{0.467}$	$T_c = \left(\frac{0{,}87L^2}{1000S_{av}}\right)^{0.385}$
0.401 hours (min=0.25)	0.000 hours

Run-off coefficient

Return period (years), T	**2**	**5**	**10**	**20**	**50**	**100**
Run-off coefficient, C_1 ($C_1=C_s+C_p+C_v$)	0.000	0.000	0.000	0.000	0.000	0.000
Adjusted for dolomitic areas, C_{1D} ($C_{1D}=C_1(1-D_a)+C_1D_a(\Sigma(D_{area}\times C_{2a}))$	0.000	0.000	0.000	0.000	0.000	0.000
Adjustment factor for initial saturation, F_1	0.500	0.550	0.6	0.670	0.830	1.000
Adjusted run-off coefficient, C_{1T} ($C_{1T}=C_{1D}\times F_1$)	0.000	0.000	0.000	0.000	0.000	0.000
Combined run-off coefficient C_T ($C_T=\alpha C_{1T}+\beta C_2+\gamma C_3$)	0.800	0.800	0.800	0.800	0.800	0.800

Rainfall

Return period (years), T	**2**	**5**	**10**	**20**	**50**	**100**
Point rainfall (mm), PT	6.83	9.22	10.88	12.54	14.77	16.31
Point intensity (mm/hour), $P_{IT}(=P_T/T_C)$	17.03	23.01	27.16	31.30	36.86	41.21
Area reduction factor (%), ARFT	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Average intensity (mm/hour), I_T ($I_T=P_{IT}\times ARF_T$)	17.0	23.0	27.2	31.3	36.9	41.2
Return period (years), T	2	5	10	20	50	100
Peak flow (m^3/s), $Q_T = \frac{C_T I_T A}{3{,}6}$	9.219	12.459	14.701	16.944	19.956	22.308

RATIONAL METHOD

Description of catchment	Township Establishment on a Portion of the Farm Klipfontein 716 and Farm Ceres 626		
River detail	Pre-Development Storm Water Run-Off		
Calculated by	E. Terblanche	Date	07/07/2020

Physical characteristics

Size of catchment (A)	2.4360	km²	Rainfall region		INLAND
Longest watercourse (L)	2.068	km	**Area distribution factors**		
Average slope (S_{av})	0.009913	m/m	Rural (α)	Urban (β)	Lakes (γ)
Dolomite area (D_a)	0	%	100%	0%	0%
Mean annual rainfall (MAR)	519	mm			
Surface roughness coefficient (f)	0.3				

Rural (C_1)

Surface slope	%	Factor	C_s
Vleis and pans	0	0.03	0.00
Flat areas	100	0.06	0.06
Hilly	0	0.16	0.00
Steep areas	0	0.26	0.00
Total	100	-	0.06
Permeability	%	Factor	C_p
Very permeable	25	0.04	0.01
Permeable	30	0.08	0.02
Semi-permeable	35	0.16	0.06
Impermeable	10	0.26	0.09
Total	100	-	0.12
Vegetation	%	Factor	C_v
Thick bush and plantation	10	0.04	0.00
Light bush and farm-lands	30	0.11	0.03
Grass lands	40	0.21	0.08
No vegetation	20	0.28	0.06
Total	100	-	0.16

Urban (C_2)

Description	%	Factor	C_2
Lawns			
Sandy, flat (<2%)	0	0.1	0
Sandy, steep (>7%)	0	0.2	0
Heavy soil, flat (<2%)	0	0.17	0
Heavy soil, steep (<7%)	0	0.35	0
Residential areas			
Houses	0	0.5	0
Flats	0	0.7	0
Industry			
Light industry	0	0.8	0
Heavy industry	0	0.9	0
Business			
City centre	0	0.7	0
Suburban	0	0.7	0
Streets	0	0.95	0
Maximum flood	0	1	0
Total (C_2)	0	-	0

Time of concentration (T_c)

Notes:

Overland Flow

$$T_c = 0.604\left(\frac{rL}{\sqrt{S_{av}}}\right)^{0.467}$$

1.419 hours (min=0.25)

Defined watercourse

$$T_c = \left(\frac{0.87L^2}{1000S_{av}}\right)^{0.385}$$

0.000 hours

Run-off coefficient

Return period (years), T	2	5	10	20	50	100
Run-off coefficient, C_s (C_1=C_s+C_p+C_v)	0.373	0.373	0.373	0.373	0.373	0.373
Adjusted for dolomitic areas, C_{sD} (C_{1D}=C_1(1-D_a)+C_1D_a(Z(D_{factor} x C_{pv})))	0.373	0.373	0.373	0.373	0.373	0.373
Adjustment factor for initial saturation, Fi	0.500	0.550	0.600	0.670	0.830	1.000
Adjusted run-off coefficient, C_T (C_T=C_{sD} x Fi)	0.187	0.205	0.224	0.250	0.310	0.373
Combined run-off coefficient C_r (C_r=αC_T + βC_2 + γC_2)	0.187	0.205	0.224	0.250	0.310	0.373

Rainfall

Return period (years), T	2	5	10	20	50	100
Point rainfall (mm), PT	36.48	49.26	58.19	67.06	79.04	88.25
Point intensity (mm/hour), P_{IT}(=P_T/T_c)	25.70	34.71	40.99	47.25	55.69	62.17
Area reduction factor (%), ARF$_T$	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Average intensity (mm/hour), I_T (I_T=P_{IT} x ARF$_T$)	25.7	34.7	41.0	47.2	55.7	62.2
Return period (years), T	2	5	10	20	50	100
$Peak\ flow(m^3/s), Q_T = \frac{C_r I_T A}{3.6}$	3.243	4.818	6.206	7.590	11.066	15.693

APPENDIX D6: TRAFFIC IMPACT REPORT

Member of the Surbana Jurong Group

Traffic Impact Assessment: Draft 1

Klipfontein Traffic Impact Assessment

Date June 20 Ref. BQ598

AUSTRALIA | ASIA | MIDDLE EAST | AFRICA | PACIFIC

Project Name:	Klipfontein Traffic Impact Assesment
Project Number:	BQ598
Report for:	Mangaung Metropolitan Municipality

REVISIONS

Revision #	Date	Prepared by	Reviewed by
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1. INTRODUCTION

1.1 Background and purpose of the study

SMEC South Africa (Pty) Ltd has been appointed by NGOTI development consultants to conduct a traffic impact assessment for the proposed mixed use development for 4000 sites on the farm cares 636 and Klipfontein 716 BD. The development is proposed and will be developed by the Mangaung Metro Municipality, see below the developer's address:

MANGAUNG METRO MUNICIPALITY

Bram Fischer Building
Cnr of Nelson Mandela Dr & Markgraaff Street
Bloemfontein
9301

The township establishment will comprise of the following land uses:

- Residential dwelling units
- Institutional Services (health centre, library, police)
- Recreational sports facility
- Schools
- Places of worship
- Public open spaces

The study will evaluate and analyse the impact of the proposed development on the road network. Also, it will evaluated the adequacy of public transport and non-motorised transport (NMT).

This study is conducted by Mr JW Botha, who is a professional engineer with approximately 40 years of experience in traffic and transportation engineering:

I, JW Botha, author of this traffic impact statement, hereby certify that I am a professional traffic engineer (ECSA Registration Number: 890274) and that I have the required experience and training in the field of traffic and transportation engineering, as required by the Engineering Council of South Africa (ECSA), to compile this traffic impact study/statement and I take full responsibility for the content, including all calculations, conclusions and recommendations made therein.

Pr Eng:890274

1.2 Locality

The proposed township establishment is located on the south-eastern region of Mangaung between the N6 and R702. The development is located on a portion of the farm Klipfontein 716 and the Farm Ceres 626, Bloemfontein.

The development can be found at the following coordinates:

- Latitude and Longitude: -29.223611, 26.264722
- GPS Coordinates: 29° 13’ 25” S; 26° 15’ 53” E

Figure 1-1: Study Area

1.3 Traffic Impact Philosophy

This TIA has been prepared in accordance to the latest Committee of Transport Officials (COTO) manuals. The traffic model for the TIA simulates the traffic movement across each key intersection in detail.

A SATURN model was previously developed to evaluate intersections in the study area. Although this model was developed in 2017 and approved by Mangaung Metro in 2018, it is by far the best tool by which to evaluate new township developments in the area as it incorporates the classic four step model on a meso-level and evaluates route decisions as far away as the Bloemfontein CBD. It is numerous levels more accurate and any locally developed TIA that only evaluates the immediate road network around the facility. The model philosophy, which was adopted, considered the following:

- The model was used to propose a road network layout that would maintain reasonable levels of service for vehicles within the study area during morning and afternoon peak hour conditions. The philosophy of the development projects' implementation is not to worsen the status quo in terms of traffic operations and capacity, where possible;
- The operational performance of the intersections affected has been quantified in terms of levels of service by the US Highway Capacity Manual (HCM). These definitions relate to the average delays at intersections for each approach and for the overall intersection to a level of service ranging from A to F, as shown in Table 1-1; and
- Level of Service A to D, as shown in Table 1-1, was considered the acceptable Level of Service for intersections considered in this analysis. A Level of Service E or F would typically require intervention, either through intersection control upgrades or geometric interventions, if appropriate or possible.

Table 1-1: Highway Capacity Definitions of Intersection Level of Service

Level of Service	Average Overall Delay per Vehicle (seconds)	
	Signals and Roundabouts	Stop Signs and Give-Way (Yield) Signs
A	<= 10	<= 10,0
B	10,1 to 20,0	10,1 to 15,0
C	20,1 to 35,0	15,1 to 25,0
D	35,1 to 55,0	25,1 to 35,0
E	55,1 to 80,0	35,1 to 50,0
F	> 80,0	> 50,0
Desirable / Maximum Recommended	**55/ 80**	**35 / 50**

1.4 Scope of Works

The scope of the project comprised of the following:

- A TIA with the aim to test the traffic impact of the proposed development;
- Proposed road new road links and hierarchy of the proposed new roads.
- Updating of the existing approved southern Mangaung Meso-simulation traffic model, using Simulation and Assignment of Traffic in Urban Road Networks (SATURN), to demonstrate the operational functionality of the road networks concerned. This includes the analysis of the proposed developments in the area;
- Preparation of upgrade requirements for each horizon year and an implementation plan including the latent rights of other developments in the area; and
- Report on the findings and recommendations of the TIA.

1.5 Traffic Model Methodology

The four-step modelling approach was used during the development of the SATURN model. The methodology followed for this TIA consists of eight phases, as presented in Figure 1-2.

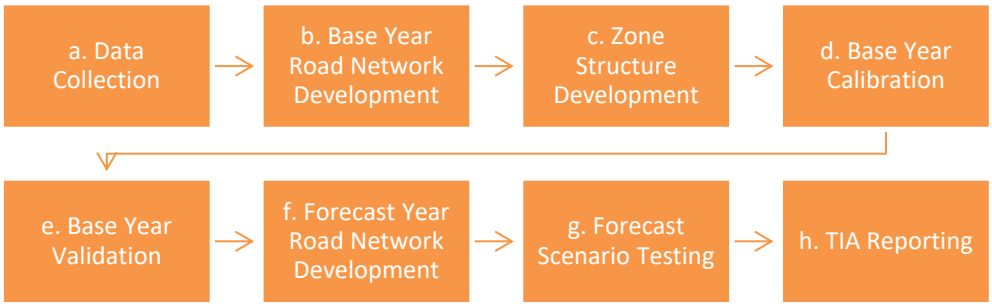


Figure 1-2: Model Methodology

1.6 Purpose of the Study

The purpose of the study is to determine and quantify the impact of the additional traffic generated by the proposed developments onto the road network within the immediate vicinity of the development sites. Recommendations on appropriate mitigation measures to be undertaken to minimize the impact are proposed in this report.

2. DEVELOPMENT PARTICULARS

As stated previously, the development is located on a portion of the farm Klipfontein 716 and Farm Ceres 626, Bloemfontein.

Figure 2-1: Location of the proposed Development

The developments proposed road network consists of local roads, two collector roads and a major arterial as indicated below. The proposed arterial will tie into Singonza St to the north. In addition, the existing constructed ring road (future national route N8) will be extended to move south to bypass the proposed development.

The proposed arterial and collector roads will not form intersections with the proposed new location of the national ring road. However, the existing section of the ring road that passes between Caleb Motsabi Ext 3 and the proposed Klipfontein development will not intersection with the new ring road and will be downgraded to serve as a collector for the Klipfontein development. The road will however, continue to link to the R702 as the existing Dewetsdorp Rd/ Ring Road intersection, see Figures 2-2 to 2-4.

Figure 2-2: Proposed major new road network

Figure 2-3: Proposed Internal road network and township layout

Figure 2-4: Existing section of ring road to be used as a collector

The development is a mixed use residential development consisting of the following land uses:

- Residential
- Social Housing
- Business
- Community facility
- Health centre
- Library
- Police Station
- Sports Field
- Primary School
- Combined School
- Crèche
- Church
- Municipal offices

3. STATUS QUO INVESTIGATION

The status quo investigation for this study considered the existing land uses, road hierarchy and traffic flow patterns.

3.1 Existing Land Use

The existing land use of the development is for agriculture. It is a portion of the farm Klipfontein 716 and Farm Ceres 626, Bloemfontein.

3.2 Existing Road Hierarchy

The road network in the immediate vicinity of the proposed development site was defined according to Mangaung Metropolitan Municipality (MMM) classification system. The existing road hierarchy is presented in Figure 3-1.

The road classifications colour index is presented in Table 3-1

Table 3-1: Road Classification Index

Road Classification	Map colour
Arterial roads (Class 1)	Light blue
Arterial roads (Class 2)	Red
Collector roads	Green
Access roads	Grey
Activity corridors	Purple
Planned / future routes	Red dashed

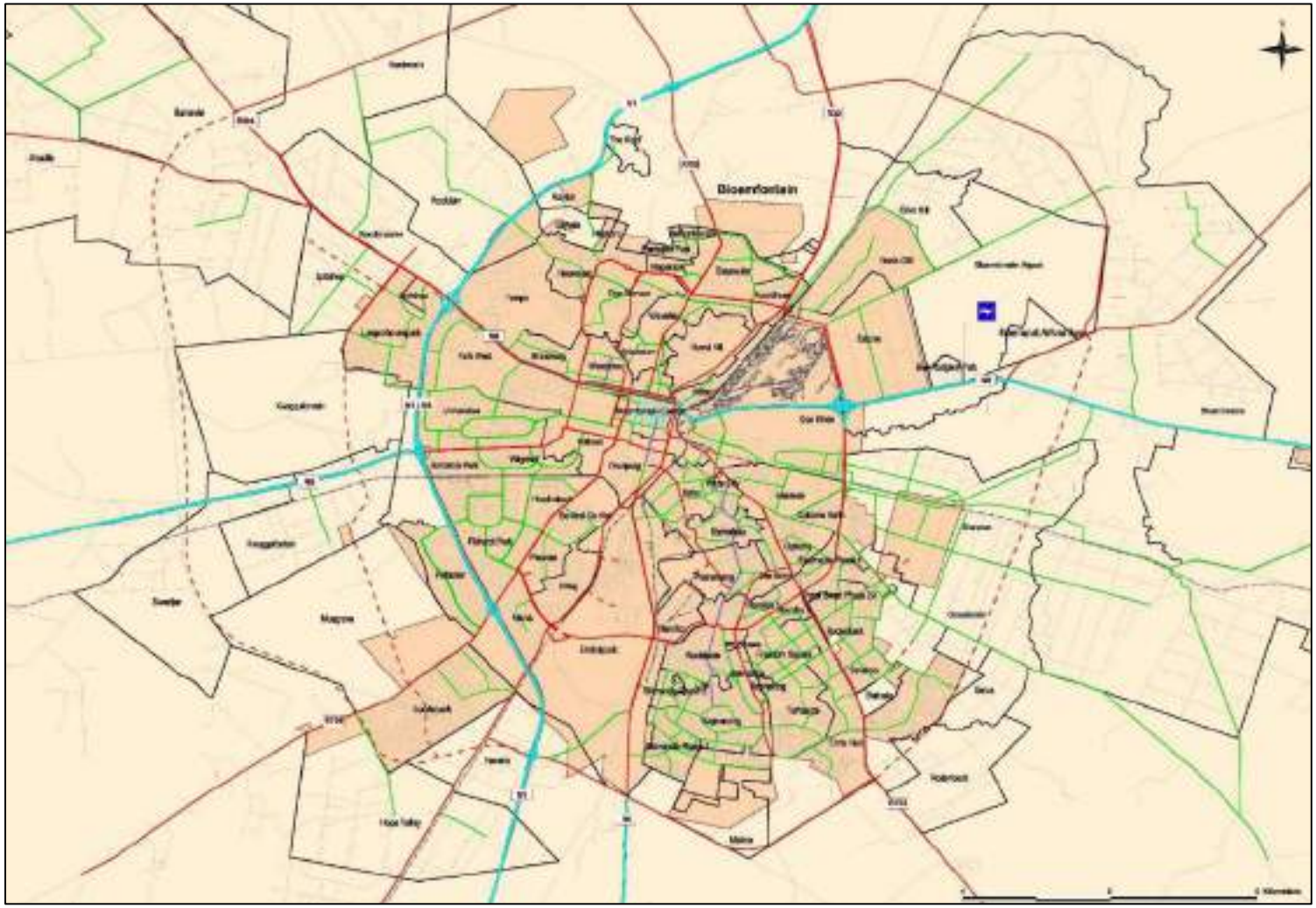


Figure 3-1: Mangaung Metropolitan Municipality Road Classification

The key roads surrounding the study area has been classified according to their road hierarchy and road surface, as shown in Table 3-2.

Table 3-2: Existing road classification

Classification	Road Name	Road Surfacing
U1	**N1**	A paved dual carriageway freeway
U1	**N6 South (extension to the south of OR Tambo Road (M30))**	A paved arterial road
U2	**N6 to N1 (OR Tambo/ M30)**	A paved arterial road
U2	**OR Tambo Road North (M30)**	A paved arterial road
U3	**Outer Ring Road**	A paved arterial road
U2	**M10**	A paved arterial road
U3	**Taelo Molosioa Street**	A paved collector road
U3	**Link Road**	A paved collector road
U3	**D.M. Selemela Street**	A paved collector road
U5	**Hartley Street**	A paved access road
U4	**Gutsche Street**	A paved access road
U4	**Singonzo Street**	A paved access road
U4	**De Waal Road**	A paved access road
U4	**Harvey Road/ Monument Road**	A paved arterial road
U4	**OR Tambo Rd (between Harvey/ Monument and Falck Street)**	A paved collector road
U5	**Falck Street**	A paved access road
U5	**Rhodes Avenue/ President Avenue**	A paved arterial road
U5	**St Georges Street**	A paved collector road
U3	**Ferreira Road**	A paved arterial road
U3	**Dewetsdorp Road/ R702**	A paved arterial road
U3	**Curie Avenue / R706**	A paved arterial road
U4	**Pellissier Drive**	A paved collector road
U2	**N8 west**	A paved arterial dual carriageway
	Walter Sisulu Road	A paved arterial road
U3	**R64**	A paved arterial road
U2	**Nelson Mandela (N8 east)**	A paved arterial road

3.3 New Internal Roads hierarchy and Intersection spacing

3.3.1 Internal Road Hierarchy

Figure 3-2: Proposed Road Layout

The proposed new development internal roads can be classified according to TRH 26 manual, functional classification of the road.

(COTO: TRH 26, 2012) Provides guidelines to road classification and access management. Both criteria (Table 3-4 & Table 3-5) is used to classify roads proposed for the development.

Mobility and access are important parameters to consider when classifying roads in the network. *Mobility is the ease with which traffic can move at relatively high speeds with the minimum of interruptions or delay. Access provides entry to the road network through driveways, intersections or interchanges.* (COTO: TRH 26, 2012, p. 11) The relationship between these two parameters is shown in Table 3-3. The required function, right of way and features allowed for each road classification is shown in Tables 3-4 and 3-5.

Table 3-3: Six-class road classification system

Number	Function	Description
Class 1	Mobility	Principal arterial
Class 2		Major arterial
Class 3		Minor arterial
Class 4	Access/activity	Collector street
Class 5		Local street
Class 6		Walkway

Table 3-4: Urban Functional Road Classification

Function			Description		Mobility				Traffic	
Basic Function	Alternate functional descriptions	Determining function	Class No (U_)	Class name	Through traffic component	Distance between parallel roads (km)	% of built km	Reach of Connectivity	Expected range of ADT (average daily traffic)	% of travel veh-km
Mobility	vehicle priority, vehicle only, long distance, through, high order, high speed, numbered, commercial, economic, strategic, route, arterial road or highway	Movement is dominant, through traffic is dominant, the majority of traffic does not originate or terminate in the immediate vicinity, the function of the road is to carry high volumes of traffic between urban districts	1	Principal arterial (freeway)	Exclusively	5 - 10 km	5 - 10% Classes U1 and U2	> 20 km	40 000 - 120 000+	40 – 65% Classes U1 and U2
			2	Major arterial	Predominant	1.5 - 5.0 km		> 10 km	20 000 - 60 000	
			3	Minor arterial	Major	0.8 - 2.0 km	15 - 25% Classes U1, U2 and U3	> 2 km	10 000 - 40 000	65 – 80% Classes U1, U2 and U3
Access / Activity	Access, mixed pedestrian and vehicle traffic, short distance, low order, low speed, community, street	Access, turning and crossing movements are allowed, the majority of traffic has an origin or destination in the immediate area, the function of the road is to provide a safe environment for vehicles and pedestrians using access points	4a	Collector street, commercial	Discourage		5 – 10%	< 2 to 3 km	< 25 000	5 – 10%
			4b	Collector street, residential	Discourage			< 2 km	< 10 000	
			5a	Local street, commercial	Prevent		65 – 80%	< 1 km	< 5 000	10 – 30%
			5b	Local street, residential	Prevent			< 0.5 km (1 km Max)	< 1 000	
			6a	Walkway, pedestrian priority	Ban					
			8b	Walkway, pedestrian only	Ban					

Table 3-5: Urban Access Management Requirements and Features

Basic Function	Description		REQUIREMENTS					TYPICAL FEATURES (use appropriate context sensitive standards for design)								
	Class No (U_)	Class name	Design typology	Route no.	Intersection spacing	Access to property	Parking	Speed km/h	Inter-section control	Typical cross section	Roadway / lane width	Road reserve width	Public transport stops and ped. xing.	Pedestrian footways (constructed)	Cycle lanes	Traffic Calming
Mobility	1	Principal arterial	Freeway	Yes (M/R/N)	2,4 km (1.6 km - 3.6 km)	not allowed	No	100-120	Interchange	4 / 6 / 8 lane freeway	3.3 - 3.7 m lanes	60 - 120 m (60 m)	No	No	No	No
	2	Major arterial	Highway	Yes (M/R)	800 m (± 15%)	Not allowed*/**	No	80	Co-ordinated traffic signal, Interchange	4 / 6 lane divided, kerbed	3.3 - 3.6 m lanes	38 - 62 m (40 m)	Yes at inter-sections	Off road	Yes – widen roadway	No
	3	Minor arterial	Main road	Yes (M)	600 m (± 20%)	Not allowed*/**	No	70	Co-ordinated traffic signal, roundabout	4 lane divided or undivided, kerbed	3.3 - 3.5 m lanes	25 - 40 m (30 m)	Yes at inter-sections	Yes	Yes – widen roadway	No
Access / Activity	4a	Collector street, commercial	Commercial major collector	No (A for temp. routing)	> 150 m	Yes (larger properties)	Yes if conditions allow	60	Traffic signal, roundabout or priority	4 lane, median at ped. xing., boulevard, CBD one-way		20 - 40 m (25 m)	Yes at inter-sections or mid block	Yes	Yes, widen road or on verge	Median for peds, curved roadway
	4b	Collector street, residential	Residential minor collector	No	> 150 m	Yes	Yes if appropriate	50	Roundabout, mini-circle or priority	2 / 3 lane undivided	6 - 9m roadway, < 3.3 m lanes	16 - 30 m (20 m)	Yes anywhere	Yes	Yes, on road or verge	Raised ped, median, narrow lanes
	5a	Local street, commercial	Commercial access street	No		Yes	Yes if conditions allow	40	Priority	2 lane plus parking		15 – 25 m (22 m)	If applicable, anywhere	Normally yes	Use roadway	Raised ped. crossing
	5b	Local street, residential	Local residential street	No		Yes	Yes on verge	40	Mini-circle, priority or none	1 / 2 lane mountable kerbs	3.0 - 5.5 m roadway (two way)	10 - 16 m (14 m)	If applicable, anywhere	Not normally, pedestrians can use roadway	Use roadway	Yes, but should not be necessary
	6a	Walkway, non-motorized priority	Pedestrian priority	No	500 m maximum	Yes	Yes if parking lot or woonerf	15	None, pedestrians have right of way	Surfaced			If applicable, anywhere	Yes or use roadway	Rare	Yes
	6b	Walkway, non-motorized only	Pedestrian only	No	500 m maximum	Yes	No vehicles	peds. 80 m / minute	None, pedestrian signal	Block paving		6 m		Yes	Yes	

** Access to properties sufficiently large to warrant a private intersection / interchange can be considered if access spacing requirement met and there is no future need for a public road.*

*** Partial and marginal access at reduced spacing allowed to relieve congestion, reduce excessive travel distances or remove the need for a full intersection*

Based on the tables of TRH 26, the existing outer ring road can be classified as major arterial road that joins the N6 from the R702 road. The existing outer ring road will be relocated to the south of the development. The location of the existing road between the development and Caleb Motsabi Ext 3 will not intersect with the relocated Outer ring road and will serve as a collector between the development and the R702. Majority of internal roads can be classified as residential streets, with two collector roads, and a minor arterial road running through the centre of the proposed development, refer to the figure above and the TRH urban road classification. The Right of Way width for the various roads are as follows:

- Proposed Arterial: 25-40m preferably 30m average (3)
- The 2 Collectors: 16-30m preferably 20m average (4b)
- Local streets: 10-16m preferably 14m (5b)

3.3.2 Intersection spacing considerations

Intersection spacing requirements have to be met in order to promote traffic safety, coordination and sufficient decision making and reaction time. COTO: TRH 26, 2012 provides intersection spacing guidelines for collector roads and arterials.

Along the Collector Roads, intersection spacing is set at a minimum of 150m. Shown in the Figure 3-4 below, these are met. On minor arterial roads, the requirement is 600m (±20%). The recommended (or longer) spacing should be maintained, but shorter spacing may be considered according to circumstances. With a relaxation of approximately 20% allowed, the intersection spacing (450m) along the minor arterial will still maintain safety and appropriate decision making distance.

Figure 3-3: Intersection spacing

3.4 Extent of the Study Area

The study area for this project is considered two fold. The first area of interest is the immediate internal network and the proposed access and the second area of intrest is the wider southern area Mangaung section of the city.

Although the development is located south of the outer ring road and the THM 16 specifies that the TIA analysis be limited to the first intersection with a class 1, 2 or 3 road or within 1.5km from the development access, the analysis of this development was not limited to this limitation. If this was the case, the analysis would only include the intersection of the proposed development Arterial/ Taelo Molosioa St/ Singonzo St, Taelo Molosioa St/ OR Tambo Rd and the Outer Ring Rd/ R700 intersections. The reasons for the wider used study area are as follows:

- The area in question has multiple developments of a similar size being developed at the same time within a reasonable distance from one another that will result in major traffic issues for the wider southern area of Mangaung.
- The volume of trips generated from the multiple developments cannot feasibly be accommodated on one or two arterials and as such, the traffic will distribute

on the multiple arterials and collectors in the area to reach the desired attraction areas within the city.

- Due to the developments approved and proposed in the area, a more sophisticated software meso-modelling tool is required to assess the true effect of the southern developments will have in combination with each other and not limited to a few intersections.
- Most of the economic opportunities are north of the development and as such the generated traffic will have an effect throughout the southern areas of Mangaung as these home based- work trips travel northward to the places of employment.
- The size of the development will have a significant effect on the southern major road network.

Based on the above reasons, the study area that was deemed to be affected by the development was the arterials and collectors between OR Tambo Rd to the Dewetsdorp Rd. Thus the development study area was assessed by including the development into the existing approved southern Mangaung SATURN Model that encompasses the entire study area and was used to assess the Klipfontein generated traffic in relation to the other southern area developments. However, with that being noted, the most relevant and or affected roads and major intersections affected by the proposed developments in the wider city was identified as per the following intersections:

- Old Link Road
    - Proposed East Collector access to the development
    - Proposed West Collector access to the development
    - Proposed Arterial access to the development
- Dewetsdorp Rd
    - R702/ Old Ring Rd
    - Dewestdorp Rd/ M10
    - Monapi St Dewetsdorp Rd
- Singonzo St
    - Singonzo St/ M10
    - Singinzo St/ Taelo Molosioa
- Taelo Molosioa St
    - Taelo Molosioa/ OR Tambo Rd
- OR Tambo Rd

  - OR Tambo Rd/ M10
  - OR Tambo Rd/ Tannery St
  - OR Tambo/ Hartley St
  - OR Tambo/ Vooruitsig St
  - OR Tambo/ Harvey St
- Dr Belcher Rd
  - Dr Belcher Rd/ Anna Maggerman Crecent
  - Dr Belcher Rd/ Heatherdale Rd
  - Dr Belcher Rd/ Mkuhlane St
- M10
  - M10/ Singonzo St
  - M10/ Moshoeshoe St
  - M10/ Piet Human
  - M10/ OR Tambo Rd

Further into the model than these intersections, the trips disperse into the wider city network. The model contains all the above intersections of concern. The model uses an origin/ destination matrix, which is based on travel time, trip distances, congestions and trip production factors. The model assigns the traffic to the trips origin and destinations through the study area and into the city. The model is calibrated using the 42 intersection counts. 4 additional intersection counts, road network and modal assignment.

The SATURN traffic model was used to evaluate and analyse the impact of the new mixed use development on the road network. The existing Saturn model for Vista Park 2, Vista Park 3, Hillside View, Brandkop 5, Bloemside phase 7, Lourierpark and Turflaagte, located in the south-eastern region of Mangaung will be updated with the newly proposed development of Klipfontein.

3.5 Traffic Counts

Manual traffic counts were conducted at 42 locations in 2016, as shown in Figure 3-4. The traffic counts were conducted on a typical weekday between 06:30 – 09:00 for the AM peak period, 12:00 – 14:00 for the off-peak period and 16:00 – 18:15 for the PM peak period. The traffic counts were categorised according to light vehicles, minibus taxis, buses and heavy vehicles. These traffic counts were done to develop the status quo Saturn model in 2017. This model then developed the scenarios and implementation plan using the trip generation parameters for all the proposed developments in the study area that are planned for development up until 2032. Thus the traffic to be generated from 2016 to 2032 is included in the already developed and approved model. As a result, the traffic counted in 2016 and in conjunction with the already approved trip generations for the developments in the study area are sufficient to calculate the background traffic for the area.

It was observed from the traffic counts that intersections to the south and closer to the development site peaked 15 minutes earlier compared to intersections located in the Bloemfontein CBD in the morning. In the afternoon, intersections within proximity of the development sites peaked 30 minutes later compared to intersections located in the Bloemfontein CBD. The traffic peak hours of intersections located within proximity of the development sites was chosen as the study area's universal peak hours. The calculated peak hours are as follows:

- Weekday AM Peak: 06:45 – 07:45; and
- Weekday PM Peak: 16:30 – 17:30.

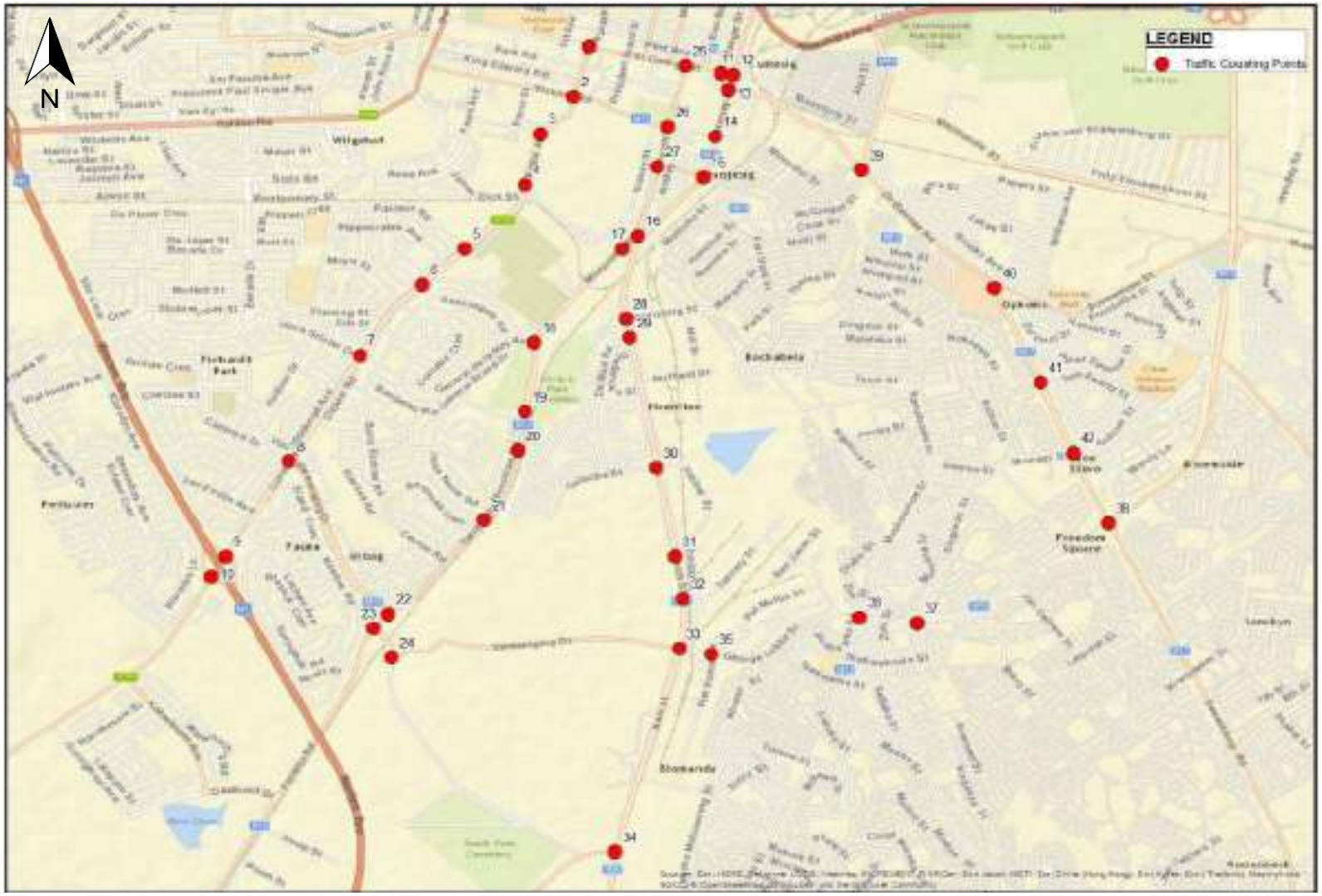


Figure 3-4: Traffic Count Locations

3.6 Additional Traffic Counts

As the development is located to the south of the existing SATURN model, additional counts were conducted as follows at the end 2019. These additional intersection counts were used to help calibrate the model further south and distribute the generated trips, Figure 3-6.

Figure 3-5: Additional 2019 traffic counts

4. TRAFFIC MODELLING METHODOLOGY

4.1 Model Development

The methodology adopted for this TIA required the use of the SATURN modelling software. The occurrence of traffic diversion, once the new development is implemented, is quantified, as the SATURN platform is capable of measuring traffic diversions on a wider area.

SATURN is primarily a multi-function traffic assignment suite with additional facilities for matrix manipulation and demand estimation from counts. It is equally applicable to strategic, regional or district wide studies, as it is to detailed city models, where the combination of simulation and assignment is particularly important. The model methodology is illustrated by the flow chart in Figure 4-1.

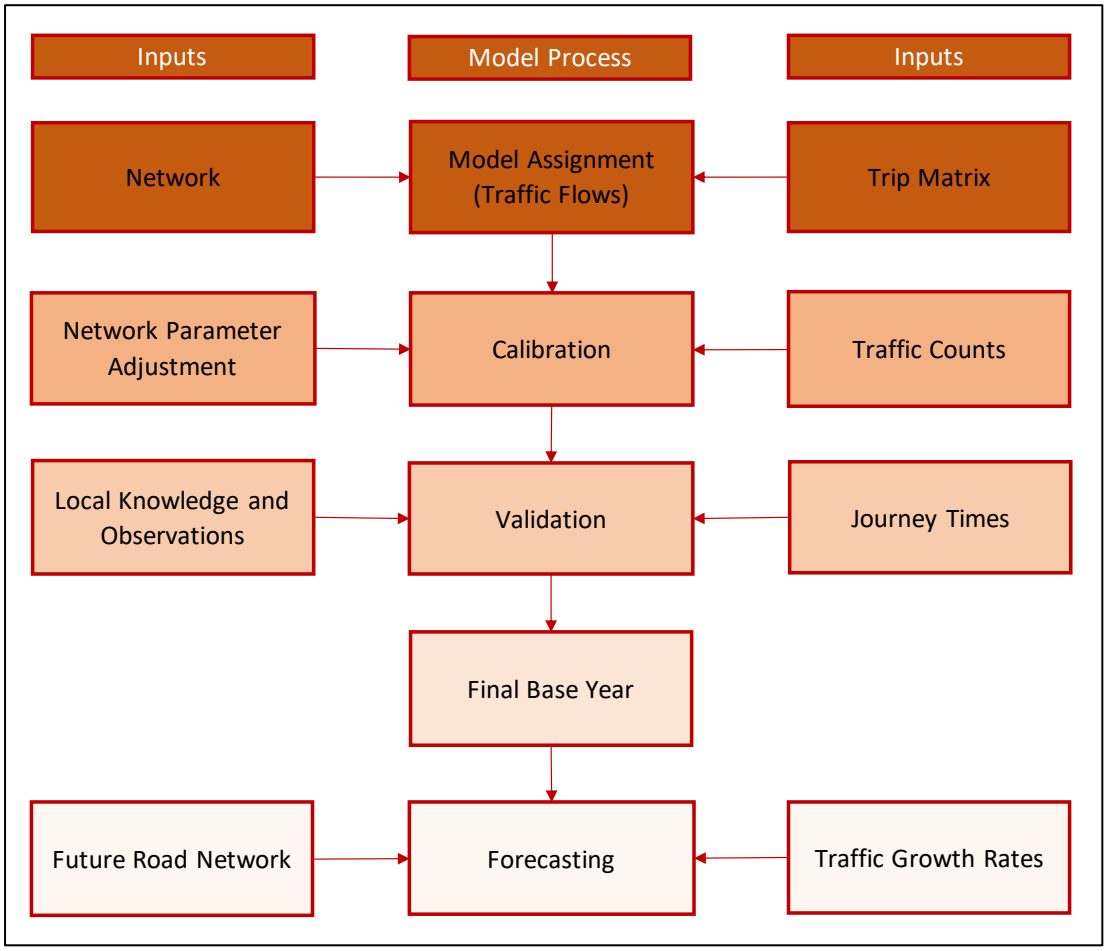


Figure 4-1: Model Flow Chart

4.2 Road Network Data

A desktop study was performed to determine the current road links and intersection configuration, supported by site visits to establish particular road network conditions. In order to verify that the modelled network correctly represents the current base year situation, a number of checks were undertaken. These were as follows:

- Correct loading of zone connectors (accesses);
- Link length checks;
- Routing through the network;
- Network hierarchy and speed flow definition;
- Capacity checks;
- Intersection control; and
- Intersection geometry.

4.3 Network Development

The Mangaung Metropolitan City SATURN model is made up of a simulation network. The coding of the simulation intersections required the definition of the following:

- The lane geometry between intersections, (i.e. the number of lanes on the links);
- The intersection geometry (i.e. number of lanes by turning movement on each approach, the turning lane lengths and turning movement saturation flows);
- The intersection control type (i.e. traffic circle, stop, yield, signals, merge);
- If signalised, the weekday AM and PM peak hour cycle time, signal plan and green and inter-green times for each stage; and
- The signal offsets.

4.4 Matrix Development

A unit matrix was developed and used as a base to be adjusted by AM and PM traffic counts during the model calibration process.

4.5 Model Calibration

Model calibration refers to the process of matching the model flows and the observed flows (traffic counts) at intersections and along links. The calibration criteria typically applied in South Africa are the standards defined in the UK Department of Transport's Design Manual for Roads and Bridges (DMRB). The key requirements of this are as shown in Table 4-1:

Table 4-1: UK Department of Transport's Validation / Calibration Criteria

Criteria	Acceptability guidelines
Assigned Hourly flows compared with observed flows:	
Individual flows within 15% for flows 700-2,700 vph	> 85% of the cases
Individual flows within 100 vph for flows< 700 vph	> 85% of the cases
Individual flows within 400 vph for flows > 2700 vph	> 85% of the cases
GEH statistic:	
Individual flows: GEH < 5	> 85% of the cases
Correlation analysis, modelled vs observed values:	
Correlation coefficient, R	0.95 (R-squared > 0.903)
Slope of the best fit regression line	between 0.9 and 1.10

The model calibration results [by time period] for the Mangaung Metropolitan City SATURN model are shown in Table 4-2. A graph showing the goodness of fit of the model vs observed data for both AM and PM peak hours is attached in Appendix A.

Table 4-2: Comparison of Assigned and Count Flows

Criteria	AM	PM
Flow < 700: modeled within +-100 of observed	93.16%	94.34%
700<Flow<2700: modeled within 15% of observed	89.58%	86.6%
Flow > 2700: modeled within 400 of observed	NA	NA
Compliance summed over all flow ranges	92.73%	93.8%
All links - GEH statistic < 5.0	86.40%	86.03%
Correlation coefficient, R	0.95	0.95

According to the above criteria, the Mangaung Metropolitan City base year SATURN model complied with the UK's DMRB guidelines. The base year 2017 model was validated using origin and destination (OD) logic checks and routing checks.

4.6 Forecasting

4.6.1 Traffic Growth Rates

Traffic growth within the study area was discussed and agreed with the Mangaung Metropolitan Municipality and is addressed in the trip generation report attached in Appendix B of this report. The traffic growth consist of the development rights of the area, which has significantly accounted to the developmental land in the study area. There is furthermore an extensive implementation plan of these developments in the study area. The developments that form the basis of the background traffic are discussed below in the future land use of the study area.

4.6.2 Future Land Use

There is one development proposed in this report. The proposed mixed-use development is the Klipfontein Development.

Proposed developments, which have already been approved by authorities, but not implemented as yet, will henceforth be referred to as “latent demand developments” throughout the rest of this report. These developments will produce latent demands, which were also taken into consideration for the forecasting exercise. These developments include the following:

- Hillside View
- Vista Park 2
- Vista Park 3
- Brandkop Subdivision 5;
- Bloemside Phase 7;
- Lourierpark; and
- Turflaagte.

(a) Proposed Developments

The proposed development is the Klipfontein Development. The development is proposed to be a mixed-use development with the following land uses:

- Residential
- Social Housing
- Business
- Community facility
- Health centre
- Library

- Police Station
- Sports Field
- Primary School
- Combined School
- Crèche
- Church
- Municipal offices

These developments were then assigned to the development types as per the THM 17 for the trip generation analysis, Table 4-3.

Table 4-3: Land uses

No.	Land Use	Unit	Raw Size	Refined size
210	Single Dwelling Units	1 D/Unit	3973	**3973**
220	Apartments and Flats	1 D/Unit	135	**135**
488	Sports stadium	1000 seat	10000	**10**
492	Health and fitness	100 sqm GLA	30	**0,3**
520	Public Primary School	1 Student	1960	**1960**
520	Public Primary School (Combined)	1 Student	2940	**2940**
560	Places of worship (Weekend)	1 Seat	300	**300**
565	Pre-school	1 Student	360	**360**
630	Medical clinic	100 sqm GLA	120	**1,2**
710	Offices	100 sqm GLA	200	**2**
770	Business Centre	100 sqm GLA	330	**3,3**

The following assumptions were made regarding the land use:

- The Social Housing will be assessed as apartments and flats
- Residential stands to be assessed as single unit dwellings
- Community facilities as health and fitness facilities
- Churches as place of worship
- Crèche as pre-school
- Health centre as medical clinic
- Municipal offices as offices

(b) Latent Demand Developments

The latent developments are as per approved development particulars:

(i) Vista Park 2

Vista Park 2 is proposed to be a mixed-use development. In 2019 the land use for the proposed development was revised. The details for each "View" is listed in Table 4-4.

Table 4-4: Vista Park 2 Land Use (2019 Update)

LAND USE	SIZE	UNIT OF MEASUREMENT
View 1		
210 – Single Dwelling Units	45	Dwelling unit
210 - Single Dwelling Units	137	Dwelling unit
220 – Apartments & Flats	245	Dwelling unit
View 2		
210 – Single Dwelling Units	141	Dwelling unit
220 – Apartments & Flats	106	Dwelling unit
520 - Public Primary School	N/A*	Student
560 – Places of Worship (Weekend)	400	Seat
565 – Pre-School	N/A*	Student
820 – Shopping Centre	486	Sqm GLA
View 3		
220 – Apartments & Flats	257	Dwelling unit
488 – Sport Stadium	500	1000 Seat
530 – Public Secondary School	N/A*	Student
565 – Pre-School	N/A*	Student
820 – Shopping Centre	5 086	Sqm GLA
820 – Shopping Centre	41 486	Sqm GLA
946 – Filling Station	N/A*	Station
View 4		
110 – Service Industry	20 100	Sqm GLA
220 – Apartments & Flats	274	Dwelling unit
710 - Offices	7 150	Sqm GLA
820 – Shopping Centre	5 886	Sqm GLA
841 – Motor Dealership	6 000	Sqm GLA
View 5		
210 – Single Dwelling Units	116	Dwelling unit
220 – Apartments & Flats	911	Dwelling unit
565 – Pre-School	70	Student
View 6		
210 - Single Dwelling Units	172	Dwelling unit
220 – Apartments & Flats	599	Dwelling unit
220 – Apartments & Flats	41	Dwelling unit
310 – Hotel Residential	40	Room
560 – Places of Worship (Weekend)	400	Seat

565 – Pre-School	70	Student
820 – Shopping Centre	1 600	Sqm GLA
View 7		
210 - Single Dwelling Units	114	Dwelling unit
220 – Apartments & Flats	313	Dwelling unit
220 – Apartments & Flats	196	Dwelling unit
View 8		
210 - Single Dwelling Units	125	Dwelling unit
220 – Apartments & Flats	93	Dwelling unit
251 – Retirement Village	45	Dwelling unit
520 - Public Primary School	N/A*	Student
560 – Places of Worship (Weekend)	800	Seat
565 – Pre-School	N/A*	Student
820 - Shopping Centre	1 114	Sqm GLA
820 - Shopping Centre	514	Sqm GLA
820 - Shopping Centre	4 257	Sqm GLA

(ii) Vista Park 3

Vista Park 3 is proposed to be a mixed use development. Table 4-5 lists the land uses for the proposed development.

Table 4-5: Vista Park 3 Land Use

Land Use		Size / Number of Units	Unit
210	Single Dwelling Units	197	1 D/Unit
210	Single Dwelling Units	282	1 D/Unit
210	Single Dwelling Units	226	1 D/Unit
210	Single Dwelling Units	423	1 D/Unit
220	Apartments and Flats	1 623	1 D/Unit
220	Apartments and Flats	776	1 D/Unit
220	Apartments and Flats	1 886	1 D/Unit
220	Apartments and Flats	431	1 D/Unit
520	Public Primary School	800	1 Student
520	Public Primary School	800	1 Student
530	Public Secondary School	1 200	1 Student
611	Public Hospital	330	1 Bed
820	Shopping Centre	15 224	100 m² GLA
820	Shopping Centre	16 014	100 m² GLA
820	Shopping Centre	13 992	100 m² GLA
820	Shopping Centre	19 496	100 m² GLA
946	Filling Station	180	1 Station

(iii) Hillside View

Hillside View is proposed to be a mixed use development. Table 4-6 lists the land uses for the proposed development.

Table 4-6: Hillside View Land Use

Land Use		Size / Number of Units	Unit
210	Single Dwelling Units	2 180	1 D/Unit
220	Apartments and Flats	4 770	1 D/Unit
561	Places of Public Worship (Weekday)	1 500	1 Seat
565	Pre-School (Day Care)	200	1 Student
566	Cemetery	0.655	1 Ha
820	Shopping Centre	7 500	100 m² GLA
820	Shopping Centre	10 000	100 m² GLA
820	Shopping Centre	400	100 m² GLA

(iv) Brandkop Subdivision 5

Brandkop Subdivision 5 will be a mixed-use development. Table 4-7 lists the land uses for the development.

Table 4-7: Brandkop Land Use

Land Use		Size / Number of Units	Unit
210	Single Dwelling Units	167	1 D/Unit
210	Single Dwelling Units	390	1 D/Unit
210	Single Dwelling Units	838	1 D/Unit
220	Apartments and Flats	626	1 D/Unit
520	Public Primary School	750	1 Student
530	Public Secondary School	750	1 Student
561	Places of Public Worship (Weekend)	1 000	1 Seat
565	Pre-School (Day Care)	150	1 Student
820	Shopping Centre	37 700	100 m² GLA

(v) Bloemside Phase 7

Bloemside Phase 7 will be a mixed-use development. Table 4-8 lists the land uses for the development.

Table 4-8: Bloemside Land Use

Land Use		Size / Number of Units	Unit
210	Single Dwelling Units	1 237	1 D/Unit

220	Apartments and Flats	344	1 D/Unit
492	Health & Fitness Centre	2 029	100 m² GLA
520	Public Primary School	750	1 Student
530	Public Secondary School	750	1 Student
561	Places of Public Worship (Weekend)	1 000	1 Seat
565	Pre-School (Day Care)	100	1 Student
630	Medical Centre	1 390	100 m² GLA
820	Shopping Centre	3 808	100 m² GLA

(vi) Lourierpark

Lourierpark will be a mixed-use development. Table 4-9 lists the land uses for the development.

Table 4-9: Lourierpark Land Use

Land Use		Size / Number of Units	Unit
130	Industrial Area (Park)	5 103	100 m² GLA
210	Single Dwelling Units	2 365	1 D/Unit
220	Apartments and Flats	483	1 D/Unit
520	Public Primary School	1 500	1 Student
530	Public Secondary School	750	1 Student
561	Places of Public Worship (Weekend)	1 000	1 Seat
565	Pre-School (Day Care)	550	1 Student
820	Shopping Centre	16 900	100 m² GLA

(vii) Turflaagte

Turflaagte will be a mixed use development. Table 4-10 lists the land uses for the development.

Table 4-10: Turflaagte Land Use

Land Use		Size / Number of Units	Unit
210	Single Dwelling Units	7 480	1 D/Unit
220	Apartments and Flats	4 476	1 D/Unit
520	Public Primary School	750	1 Student
520	Public Primary School	750	1 Student
520	Public Primary School	750	1 Student
530	Public Secondary School	750	1 Student
530	Public Secondary School	750	1 Student
530	Public Secondary School	750	1 Student
561	Places of Public Worship (Weekend)	1 000	1 Seat
565	Pre-School (Day Care)	330	1 Student

630	Medical Clinic	1 110	100 m² GLA
820	Shopping Centre	126 680	100 m² GLA

4.6.3 Accesses for Klipfontein

There are three proposed access for the development. These access are spaced 450m apart and subdivided the development into three equal sections.

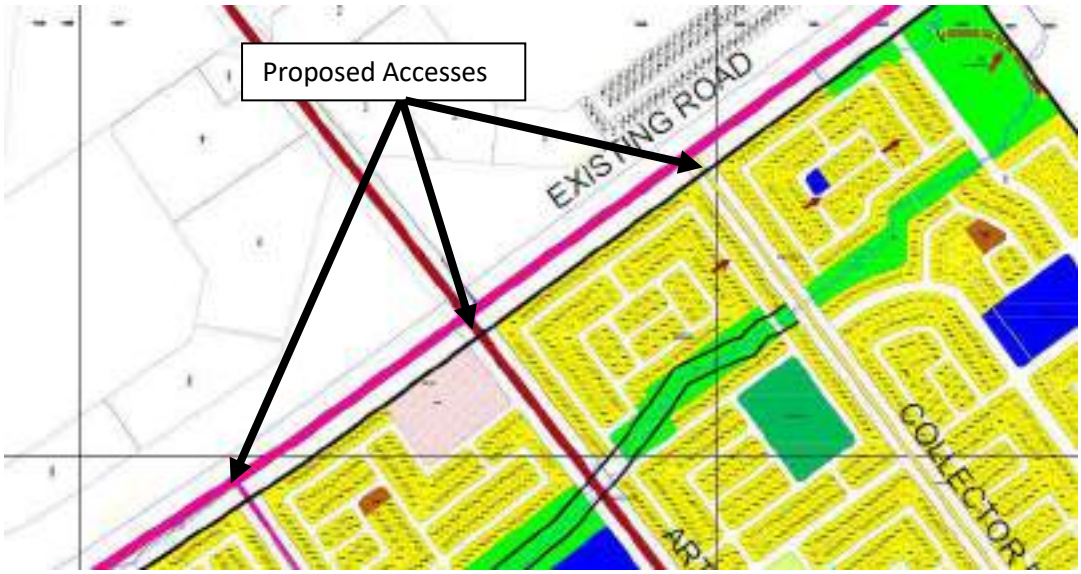


Figure 4-2: Proposed Accesses for the development

4.6.4 Trip Generation

(a) Latent Demand

The trip generation analysis for the forecast years of the Klipfontein SATURN model is detailed in **Appendix B** for the latent rights.

The approved trip generation calculations produced for the OR Tambo Saturn model study in 2017 area took into account the effect of the existing development of VISTA phase 1, the developments of Vista Park 2,3 and Hillside View and the latent right pre 2017 of the developments of Brandkop sub-division 5, Bloemside phase 7, Lourierpark and Turflaagte.

By including the above latent rights as background traffic and observing the space for development and expected trip generations produced by these latent developments, it will not be required to apply an additional background traffic growth. Therefore by including the latent rights to the expected traffic, the possible future growth is thus included. Therefore the total trips generated by the existing and latent rights area are as per Table 4-11 below.

Table 4-11: Latent rights trip generation totals

DEVELOPMENTS	AM PEAK	PM PEAK	SATURDAY PEAK
Existing			
Vista Park 1	*1 430*	*999*	*Did not count*
Latent demand post 2017			
Vista Park 2	3 033	5 947	6 478
Vista Park 3	3 485	5 362	5 543
Hillside View	3 115	3 947	3 033
Latent demand pre 2017			
Brandkop	1 549	2 296	2 292
Bloemside	1 341	1 409	925
Lourierpark	2 157	2 434	1 839
Turflaagte	4 578	5 337	4 367
Total	**19 258**	**26 732**	**24 477**

(b) Klipfontein Generated Trips

The trips that are generated from the Klipfontein development were calculated from the TMH 17 and using various assumptions. The tables below contain the trip generation assumptions.

- Reduction factors of low vehicle ownership and mixed use developments was used on all land uses.
- Residential units of 3973 were assessed as single Dwelling units.
- The social housing was assessed as Apartments and Flats. It was assumed that 65 square meters would be allocated per unit, which amounts to 135 dwelling units for both land uses.
- The sports stadium was used Bohlokong Stadium as a reference and allowed for 1000 seats.
- For the schools it was assumed to amount to 35 scholars per class and an average of 4 classes per graded.
- Places of worship was estimated at 300 seats for a similar size facility.
- Pre-school was estimated at 360 scholars for the facility size.
- Based on the TMH 17 and the proposed land uses, no diverted and or by-pass trips were generated.

Based on these assumptions the trips were calculated as per the TMH 17, Table 4-12 and 4-13.

Table 4-12: Trip generation calculation

THM 17 Trip Generation Calculation Code

Trip Generation Factors																															
Development		Development Size			Mixed use (Yes or No)	Revised mixed use factor	car ownership (Normal or Low or Very Low)	Revised car ownership factor	Transit node corridor (Yes or No)	Transit Factor	Combined Trip Reduction Factor	Trip factor	Pass-by Trips	Diverted Trips	Trips	Trip Rate AM	Trip Rate PM	Friday PM	Mid day	Evening	Saturday	Sun day		Trips AM	Trips PM	Friday PM	Mid day	Evening	Saturday	Sun day
No.	Description	Unit	Raw Size	Refined size																											
210	Single Dwelling Units	1 D/Unit	3973	**3973**	Yes	10%	Low	40%	No	0%	46,00%	**54,0%**	N/A	N/A	**2145**	1	1	0	0	0	0,5	0,5		2 145	2 145	0	0	0	1 073	1 073
220	Apartments and Flats	1 D/Unit	135	**135**	Yes	15%	Low	30%	No	0%	40,50%	**59,5%**	N/A	N/A	**80**	0,65	0,65	0	0	0	0,35	0,35		52	52	0	0	0	28	28
488	Sports stadium	1000 seat	10000	**10**	Yes	5%	Low	30%	No	0%	33,50%	**66,5%**	N/A	N/A	**7**	0	150	0	0	270	170	0		0	998	0	0	1796	1 131	0
492	Health and fitness	100 sqm GLA	30	**0,3**	Yes	15%	Low	20%	No	0%	32,00%	**68,0%**	N/A	N/A	**0**	5	9,5	0	0	0	0	0		1	2	0	0	0	0	0
520	Public Primary School	1 Student	1960	**1960**	Yes	30%	Low	50%	No	0%	65,00%	**35,0%**	N/A	N/A	**686**	0,85	0,3	0	0,35	0	0	0		1 060	206	0	437	0	0	0
520	Public Primary School (Combined)	1 Student	2940	**2940**	Yes	30%	Low	50%	No	0%	65,00%	**35,0%**	N/A	N/A	**1029**	0,85	0,3	0	0,35	0	0	0		1 590	309	0	655	0	0	0
560	Places of worship (Weekend)	1 Seat	300	**300**	Yes	10%	Low	50%	No	0%	55,00%	**45,0%**	N/A	N/A	**135**	0,05	0,05	0	0	0	0	0,65		7	7	0	0	0	0	88
561	Places of worship (Weekday)	1 Seat	100	**100**	Yes	10%	Low	50%	No	0%	55,00%	**45,0%**	N/A	N/A	**45**	0,05	0,05	0	0	0	0	0		2	2	0	0	0	0	0
565	Pre-school	1 Student	360	**360**	Yes	5%	Low	50%	No	0%	52,50%	**47,5%**	N/A	N/A	**171**	1	0,8	0	0,3	0	0	0		237	201	0	51	0	0	0
630	Medical clinic	100 sqm GLA	120	**1,2**	Yes	0%	Low	50%	No	0%	50,00%	**50,0%**	N/A	N/A	**1**	6	6	0	4,2	0	7,8	0		4	4	0	3	0	5	0
710	Offices	100 sqm GLA	200	**2**	Yes	20%	Low	20%	No	0%	36,00%	**64,0%**	N/A	N/A	**1**	2,1	2,1	0	0	0	0,45	0,15		3	3	0	0	0	1	0
770	Business Centre	100 sqm GLA	330	**3,3**	Yes	15%	Low	20%	No	0%	32,00%	**68,0%**	N/A	N/A	**2**	1,5	1,5	0	0	0	0	0		3	3	0	0	0	0	0
Total															**5 105**	**3 932**	**0**	**1 145**	**1 796**	**2 237**	**1 189**	**0**								

Table 4-13: Trip Generation Split

Trip Generation Split (IN/OUT)

No.	Land Use	Total Trips Generated											AM Trips		PM Trips		Midday Trips		Evening Trips		Saturday Trips		Sunday Trips	
		Trips AM	Trips PM	Friday PM	Midday	Evening	Saturday	Sunday	Pass By Trips PM	Pass By Trips Sat	Div. PM	Div. Sat	New Trips		New Trips		New Trips		New Trips		New Trips		New Trips	
													IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
210	Single Dwelling Units	2 145	2 145	0	0	0	1 073	1 073	0	0	0	0	536	1609	1502	644	0	0	0	0	536	536	536	536
220	Apartments and Flats	52	52	0	0	0	28	28	0	0	0	0	13	39	37	16	0	0	0	0	14	14	14	14
488	Sports stadium	0	998	0	0	1 796	1 131	0	0	0	0	0	0	0	898	100	0	0	180	1616	1017	113	0	0
492	Health and fitness	1	2	0	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0
520	Public Primary School	2 650	515	0	1 091	0	0	0	0	0	0	0	1325	1325	257	257	491	600	0	0	0	0	0	0
560	Places of worship (Weekend)	7	7	0	0	0	0	88	0	0	0	0	4	3	3	3	0	0	0	0	0	0	48	39
561	Places of worship (Weekday)	2	2	0	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0
565	Pre-school	237	201	0	51	0	0	0	0	0	0	0	118	118	101	101	26	26	0	0	0	0	0	0
630	Medical clinic	4	4	0	3	0	5	0	0	0	0	0	2	1	1	2	1	1	0	0	2	3	0	0
710	Offices	3	3	0	0	0	1	0	0	0	0	0	2	0	1	2	0	0	0	0	0	0	0	0
770	Business Centre	3	3	0	0	0	0	0	0	0	0	0	3	1	1	3	0	0	0	0	0	0	0	0
	Total												**2006**	**3099**	**2802**	**1129**	**518**	**627**	**180**	**1616**	**1570**	**666**	**599**	**590**

4.6.5 Trip Distribution

(a) Model Trip Distribution

The trip distribution for the proposed developments' generated trips made use of a Gravity Model, as shown in Figure 4-3. The existing land use patterns were used as a guide to establish the distribution patterns to the key attraction nodes in the study area. This aspect is handled entirely by the SATURN model and no hand allocations were performed.

Figure 4-3: Trip Distribution

4.6.6 Model Trip Assignment

The assignment of trips to the road network is based on Stochastic User Equilibrium assignment and is based on the following proposition:

"Traffic arranges itself on congested networks such that the routes chosen by individual drivers are those with the minimum perceived cost; routes with perceived costs in excess of the minima are not used."

Stochastic User Equilibrium is based on the assumption that it is more likely that "perceived costs" would influence route choice as opposed to pure generalised costs as used in an equilibrium assignment algorithm. Due to the above, the stochastic user equilibrium assignment algorithm was used.

(a) Internal Road Network

In addition to the above model development. The access and the internal modal slip and distribution was done to assess the by distribution the trips in accordance with the trip generations, land use and town ship establishment. As part of the study, the internal major road network trips were distributed and assessed. The trips were assigned based

on the trip production and attraction developments within the developments. It was assumed due to the trip reduction factors, the mixed use average mixed use reduction factor would account for the additional internal trips only. These additional trips were then added to the generated trips for the internal network and distributed accordingly.

There are 9 major intersections within the development that were assessed as well as the three accesses and the R702 intersection for the purposed of the internal road network. The accesses and 9 major internal intersections are shown in Figure 4-4 below:

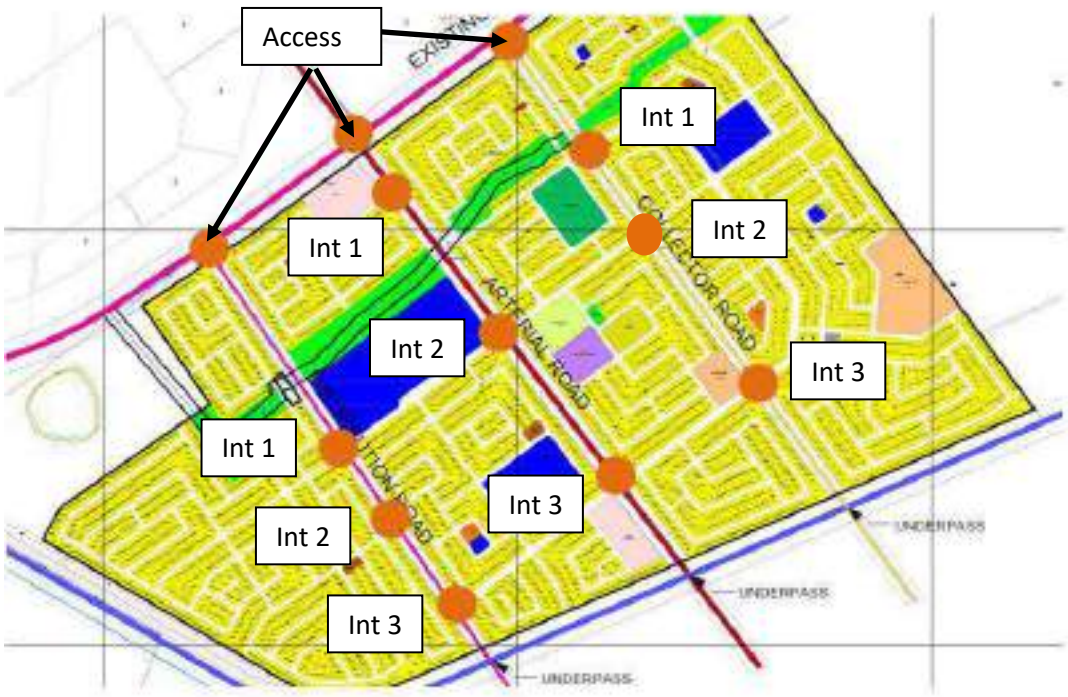


Figure 4-4: Location of Access and internal intersections

The trips were split to the individual roads. Here after the trips were split into the turning movements of the major internal intersections. Hereafter, the additional internal trips were calculated and distributed and final the trips were balanced.

Table 4-14: Trip Assignment to the developments_ AM peak

Access							
AM In		Road Split					
Land Use	Trips	Arterial		Collector (East)		Collector (West)	
Sports Field	0	50%	0	50%			
Combined School	795	80%	636			20%	159
Primary School	265		0	100%	265		
Primary School	265	50%	133			50%	133
Municipal	3		0	100%	3		
Houses	536	50%	268	25%	134	25%	134

Flats	13		0	100%	13		
Community	10	80%	5	10%	1	10%	1
Crèche	118		0	66%	78	33%	39
Total			1042		494		465

AM Out		Road Split				
Land Use	Trips	Arterial		Collector (East)		Collector (West)
Sports Field	0	50%		50%		
Combined School	795	80%	636		20%	159
Primary School	265			100%	265	
Primary School	265	50%	133		50%	133
Municipal	3			100%	3	
Single Dwelling	1609	50%	805	25%	402	25%	402
Flats	39			100%	39		
Community	2	80%	5	10%	1	10%	1
crèche	118			66%	78	33%	39
Total			1578		788		734

The AM peak was calculated as the worst case scenario and was assessed for the capacity purposes. Thus the distributions was done based on the AM peak period.

Table 4-15: Intersection Turning movements along the proposed Arterial_ Generated Trips

AM Peak		Turning splits									
	Arterial	Int 1		Int 2				Int3			
Land Use	Trips	Trips	Direction	Trips	Direction	Trips	Direction	Trips	Direction	Trips	Direction
Sports Field	0	0	West	0	West	0	East	0	West	0	East
Combined School	636	0	West	636	West	0	East	0	West	0	East
Primary School	0	0	West	0	West	0	East	0	West	0	East
Primary School	133	0	West	13	West	0	East	120	West	0	East
Municipal	0	0	West	0	West	0	East	0	West	0	East
Single Dwelling	268	29	West	32	West	73	East	63	West	71	East
Flats	0	0	West	0	West	0	East	0	West	0	East
Community	5	1	West	1	West	2	East	1	West	0	East
crèche	0	0	West	0	West	0	East	0	West	0	East
Total	1042	30		682		75		184		71	
AM Peak		Turning splits Out									
	Arterial	Int 1		Int 2		Int3					
Land Use	Trips	Trips	Direction	Trips	Direction	Trips	Direction	Trips	Direction	Trips	Direction
Sports Field	0	0	West	0	West	0	East	0	West	0	East
Combined School	636	0	West	636	West	0	East	0	West	0	East
Primary School	0	0	West	0	West	0	East	0	West	0	East
Primary School	133	0	West	23	West	0	East	110	West	0	East
Municipal	0	0	West	0	West	0	East	0	West	0	East
Single Dwelling	805	80	West	89	West	218	East	185	West	233	East
Flats	0	0	West	0	West	0	East	0	West	0	East
Community	5	1	West	1	West	2	East	1	West	0	East
crèche	0	0	West	0	West	0	East	0	West	0	East
Total	1578	81		749		220		296		233	

Table 4-16: Intersection Turning movements along the proposed Collectors West+ East_ Generated Trips

AM Peak		Turning splits In							
	Collector West	Int 1				Int 2		Int 3	
Land Use	Trips	Trips	Direction	Trips	Direction	Trips	Direction	Trips	Direction
Sports Field	0	0	West	0	East	0	West	0	East
Combined School	159	0	West	159	East	0	West	0	East
Primary School	0	0	West	0	East	0	West	0	East
Primary School	133	0	West	21	East	0	West	112	East
Municipal	0	0	West	0	East	0	West	0	East
Single Dwelling	134	81	West	16	East	27	West	10	East
Flats	0	0	West	0	East	0	West	0	East
Community	1	0	West	0	East	0	West	1	East
crèche	39	0	West	0	East	0	West	39	East
Total	466	81		196		27		162	
AM Peak		Turning splits Out							
	Collector West	Int 1				Int 2		Int 3	
Land Use	Trips	Trips	Direction	Trips	Direction	Trips	Direction	Trips	Direction
Sports Field	0	0	West	0	East	0	West	0	East
Combined School	159	0	West	159	East	0	West	0	East
Primary School	0	0	West	0	East	0	West	0	East
Primary School	133	0	West	18	East	0	West	115	East
Municipal	0	0	West	0	East	0	West	0	East
Single Dwelling	402	241	West	48	East	81	West	32	East
Flats	0	0	West	0	East	0	West	0	East
Community	1	0	West	0	East	0	West	1	East
crèche	39	0	West	0	East	0	West	39	East
Total	734	241		225		81		187	

Internal Intersections	AM Peak	Turning splits In							
	Collector East	Int 1		Int 2		Int 3			
Land Use	Trips	Trips	Direction	Trips	Direction	Trips	Direction	Trips	Direction
Sports Field	0	0	East	0	West	0	West	0	East
Combined School	0	0	East	0	West	0	West	0	East
Primary School	265	265	East	0	West	0	West	0	East
Primary School	0	0	East	0	West	0	West	0	East
Municipal	3	0	East	0	West	0	West	3	East
Single Dwelling	134	40	East	26	West	27	West	41	East
Flats	13	0	East	0	West	3	West	10	East
Community	1	0	East	0	West	0	West	1	East
crèche	78	47	East	0	West	0	West	31	East
Total	494	352		26		30		86	

Internal Intersections	AM Peak	Turning splits In							
	Collector East	Int 1		Int 2		Int 3			
Land Use	Trips	Trips	Direction	Trips	Direction	Trips	Direction	Trips	Direction
Sports Field		0	East	0	West	0	West	0	East
Combined School		0	East	0	West	0	West	0	East
Primary School	265	265	East	0	West	0	West	0	East
Primary School		0	East	0	West	0	West	0	East
Municipal	3	0	East	0	West	0	West	3	East
Single Dwelling	402	117	East	80	West	81	West	83	East
Flats	39	0	East	0	West	7	West	32	East
Community	1	0	East	0	West	0	West	1	East
crèche	78	47	East	0	West	0	West	31	East
Total	788	429		80		88		150	

The additional internal trips, the trips produced that are assumed to only be internal and not have an effect on the external network were then calculated. The assumption was made that the average mixed use reduction factor would account for the additional local internal trips. These were calculated at 15% of the total AM peak generated trips. This amounted to 766 additional trips. The trips were then distributed to the above major internal intersections as follows:

Table 4-17: Arterial Internal Trips

Arterial		Direction	Movements
Int 2	East	Straight	63
		Left	12
		Right	6
	Total		81
	West	Straight	101
		Left	7
		Right	5
	Total		113
Int 1	West	Left	33
		Right	6
	Total		39
Int 3	East	Straight	40
		Left	1
		Right	9
	Total		50
	West	Straight	43
		Left	15
		Right	3
	Total		63

Table 4-18: Collector West Internal trips

Collector West		Direction	Movements
Int 1	East	Straight	19
		Left	2
		Right	1
	Total		22
	West	Straight	97
		Left	3
		Right	21
	Total		121
Int 2	West	Left	8
		Right	58

	Total		66
Int 3	East	Left	9
		Right	1
	Total		10

Table 4-19: Collector East Internal Trips

Collector East		Direction	Movements
Int 3	East	Straight	71
		Left	2
		Right	15
	Total		**88**
	West	Straight	27
		Left	6
		Right	2
	Total		**35**
Int 2	West	Left	8
		Right	58
	Total		**30**
Int 1	East	Left	63
		Right	5
	Total		**67**

The trips were added together and balanced through the internal network.

5. CAPACITY ANALYSIS

The capacity analysis was done for the years 2022 and 2032. The base year of the development was identified to be in operation by 2022. This assumptions was developed as per the flowing expected time constraints:

- TIA submission June 2020
- TIA approval July/ August 2020
- Approval of township establishment August/ September 2020
- Detailed designs and tender documentation February/ March 2021
- Appointment of a contractors April/ May 2021
- Completion of construction December 2021
- Development in operations by January 2022

As a result of the estimated time frames, the existing 2022 Saturn analysis would serve as the base year for the development to be in operation. The traffic is then further analysed to 2032 to include the other approved latent developments and land uses in the area that will become operational between 2022 and 2032. This then allows for the background traffic growth to be assessed with regards to the effect the proposed development will have on approved and forecasted developments. As a result, the following scenarios were analyzed:

- Previous Saturn Base Year 2017 AM and PM Peak hours.
- Mid-term 2022 + latent rights only, AM and PM Peak hours.
- Horizon 2032 + latent rights only, AM and PM Peak hours.
- Mid-term 2022 + latent rights and Development, AM and PM Peak hours.
- Horizon 2032 + latent rights and Development, AM and PM Peak hours.
- Access and Internal intersections design (SIDRA Analysis)

The operational performance of the road network has been quantified in terms of Level of Service as defined by the US Highway Capacity Manual (HCM). These definitions relate average delays at intersections (for individual turning movements, for each approach and for the overall intersection) to a level of service ranging from A to E, as are shown in Table 5-1:

Table 5-1: Intersection Level of Service Criteria

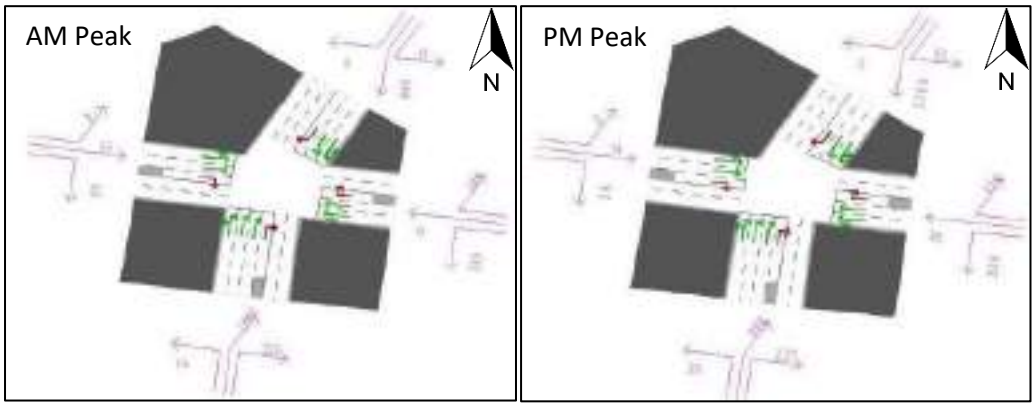
Level of Service	Average Overall Delay per Vehicle (seconds)	
	Signals and Roundabouts	Stop and Yield Signs
A	<= 10	<= 10,0
B	10,1 to 20,0	10,1 to 15,0
C	20,1 to 35,0	15,1 to 25,0
D	35,1 to 55,0	25,1 to 35,0
E	55,1 to 80,0	35,1 to 50,0
F	> 80,0	> 50,0
Desirable / Maximum Recommended	**55/ 80**	**35 / 50**

5.1 Original Saturn model Base Year 2017

In order to determine the state of capacity operations at intersections within the study area, a base year analysis has to be undertaken. This analysis what was done in 2017 for the study area as a whole and as a result was used as the original base year study. Detailed capacity analysis results and link flows in vehicles per hour, for the 2017 Base year, are shown in Appendix C. Location of intersections analysed is shown Figure 3-2 in chapter 3 of this report.

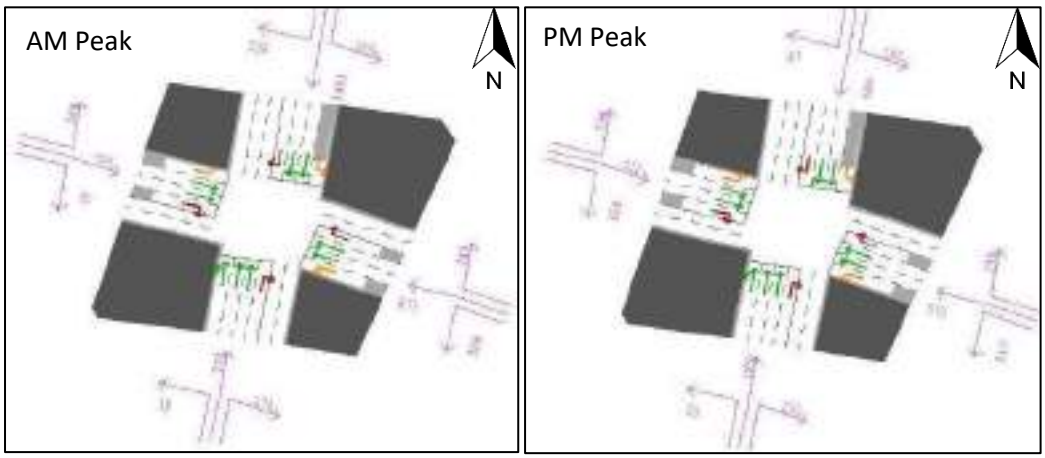
(a) Intersection 1: President Boshof Street & St Georges Street

All approaches are currently operating at acceptable LOS during both AM and PM peak hours. Turning flows are shown in the Figure below:



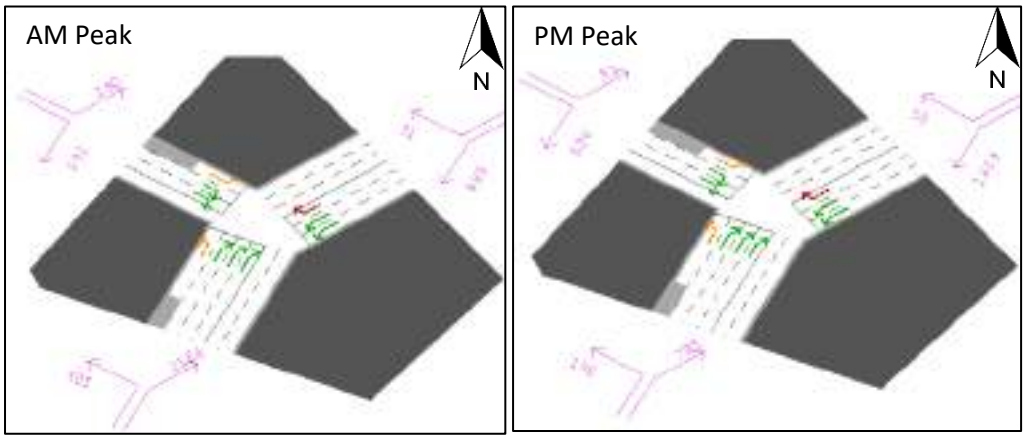
(b) Intersection 2: Kolbe Avenue & President Avenue

The west approach is currently operating at poor LOS F during the PM peak hour. Optimisation of the current signal plan will improve operations at this approach to LOS C as shown in the upgrades results table attached in Appendix C. Turning flows are shown in the Figure below:



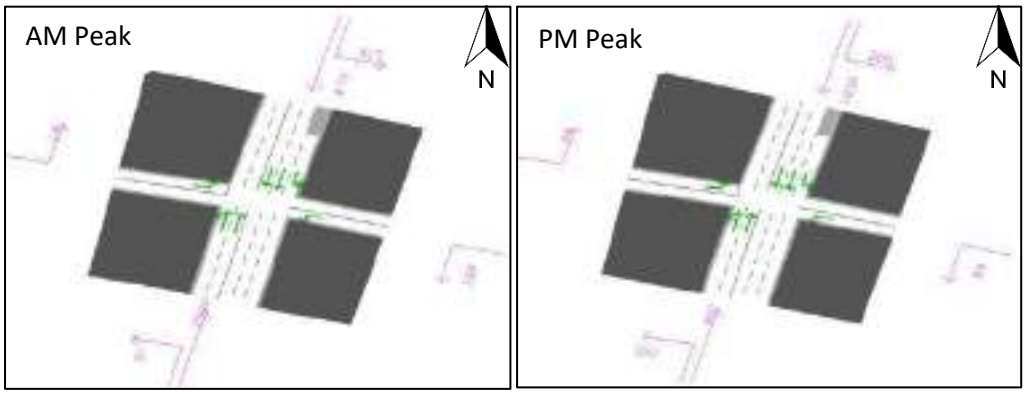
(c) Intersection 3: Kolbe Avenue & Roth Avenue

All approaches are currently operating at acceptable LOS during both AM and PM peak hours. Turning flows are shown in the Figure below:



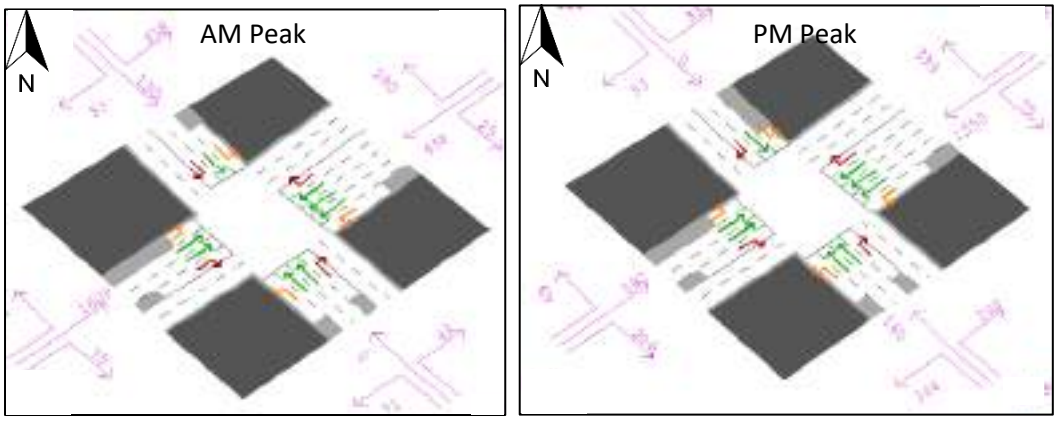
(d) Intersection 4: Curie Avenue & Nico Van Der Merwe

The east approach is currently operating at poor LOS E during the AM peak hour and poor LOS F during the PM peak hour. A SMEC designed solution discarding all right turns at this intersection will improve operations to LOS A for the west approach as shown in the upgrades results. The proposed solution is shown Appendix C. Turning flows are shown in the Figure below:



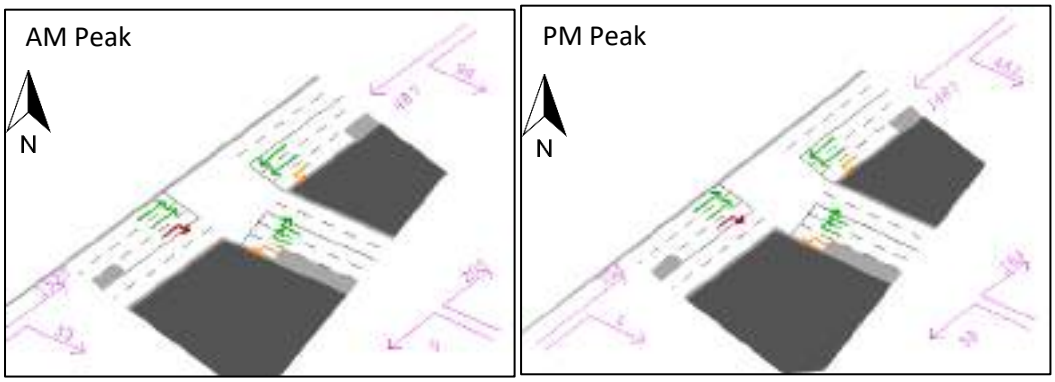
(e) Intersection 5: Curie Avenue & Pasteur Avenue

The west approach is currently operating at poor LOS F during the AM peak hour. Optimisation of the current signal plan will improve operations at this approach to LOS B as shown in the upgrades results table attached in Appendix C. Turning flows are shown in the Figure below:



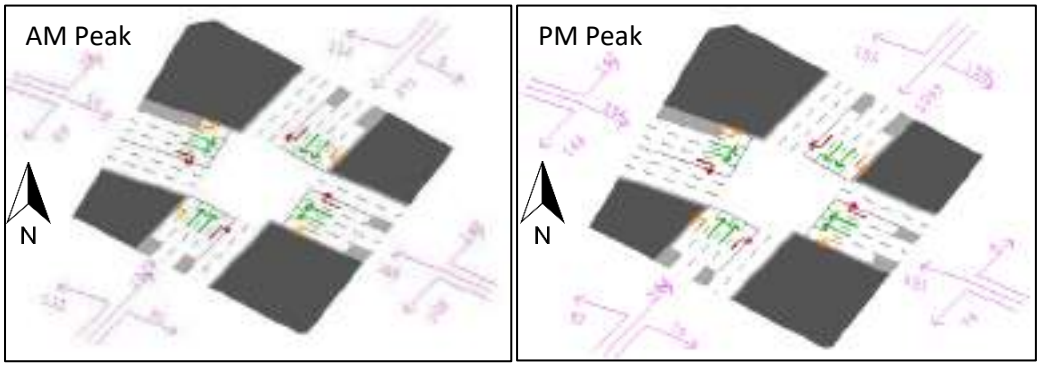
(f) Intersection 6: Curie Avenue & Sannaspos Road

All approaches are currently operating at acceptable LOS during both AM and PM peak hours. Turning flows are shown in the Figure below:



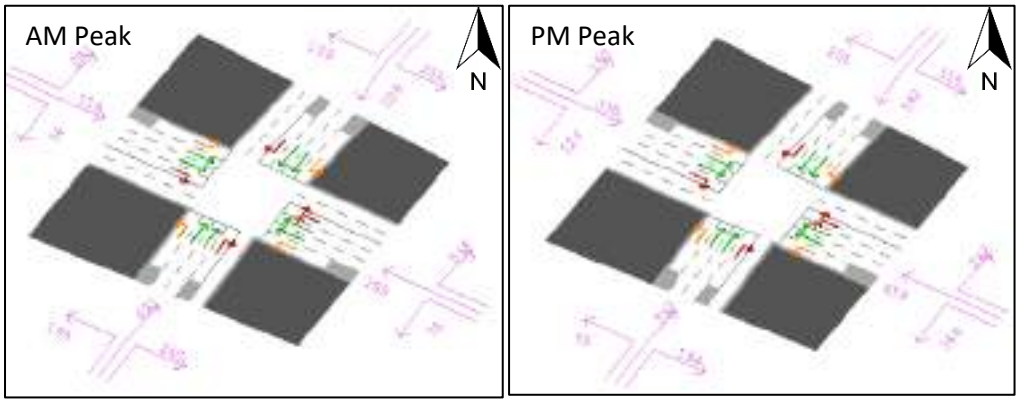
(g) Intersection 7: Curie Avenue & Generaal De La Rey

All approaches are currently operating at acceptable LOS during both AM and PM peak hours. Turning flows are shown in the Figure below:



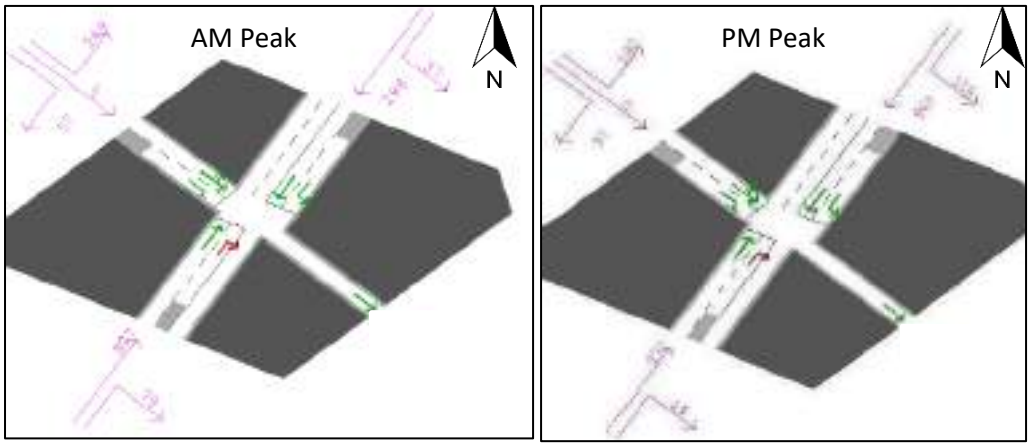
(h) Intersection 8: Curie Avenue & Vereeniging Drive

All approaches are currently operating at acceptable LOS during both AM and PM peak hours. Turning flows are shown in the Figure below:



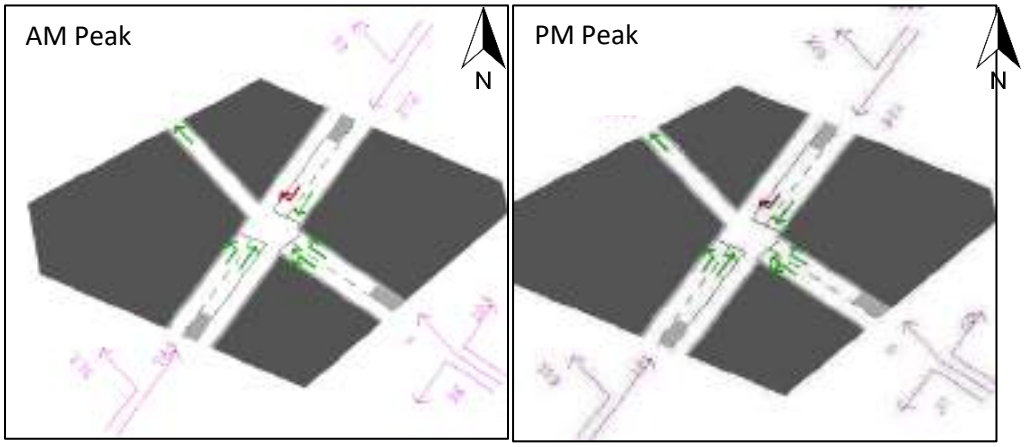
(i) Intersection 9: N1 & Curie Avenue Off Ramp (Northern Quadrant)

The west approach is currently operating at poor LOS F during the AM peak hour. Optimisation of the current signal plan will improve operations at this approach to LOS D as shown in the upgrades results table attached in Appendix C. Turning flows are shown in the Figure below:



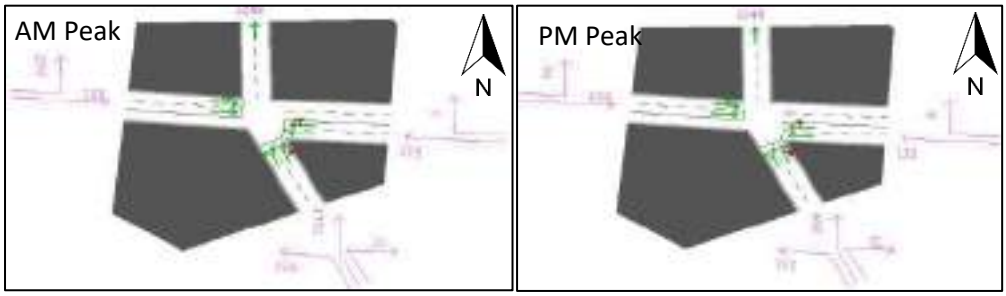
(j) Intersection 10: N1 & Curie Avenue Off Ramp (Southern Quadrant)

The east approach is currently operating at poor LOS F during the AM peak hour. Optimisation of the current signal plan will improve operations at this approach to LOS D as shown in the upgrades results table attached in Appendix C. Turning flows are shown in the Figure below:



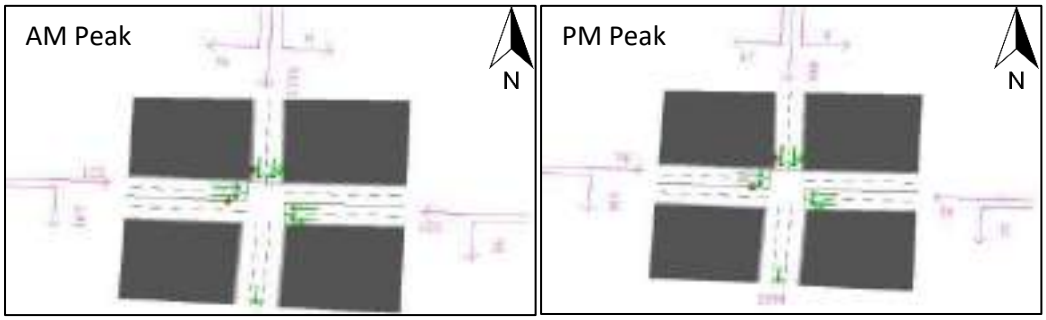
(k) Intersection 11: St Georges & Hanger Street

All approaches are currently operating at acceptable LOS during both AM and PM peak hours. Turning flows are shown in the Figure below:



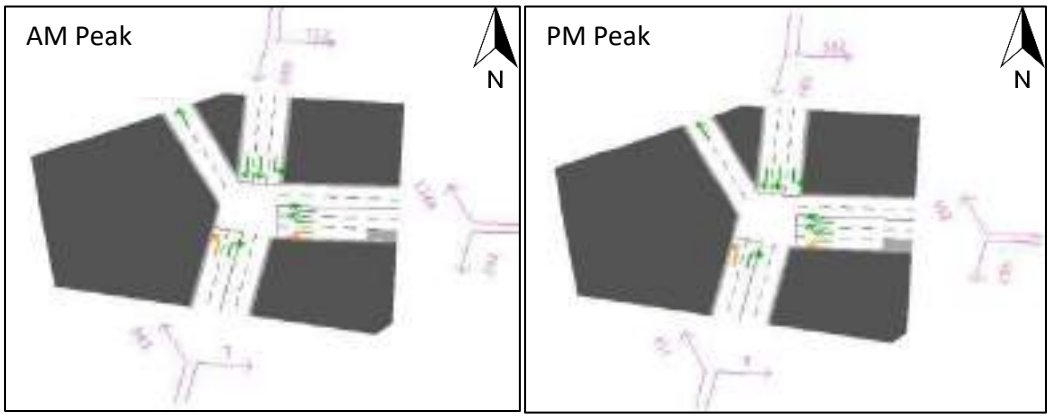
(l) Intersection 12: St Georges & Harvey Road

All approaches are currently operating at acceptable LOS during both AM and PM peak hours. Turning flows are shown in the Figure below:



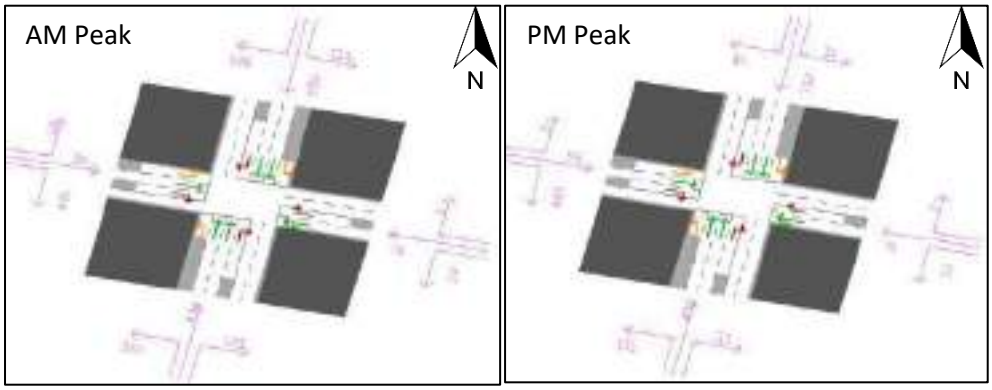
(m) Intersection 13: Harvey Road & Hanger & Fort Street

All approaches are currently operating at acceptable LOS during both AM and PM peak hours. Turning flows are shown in the Figure below:



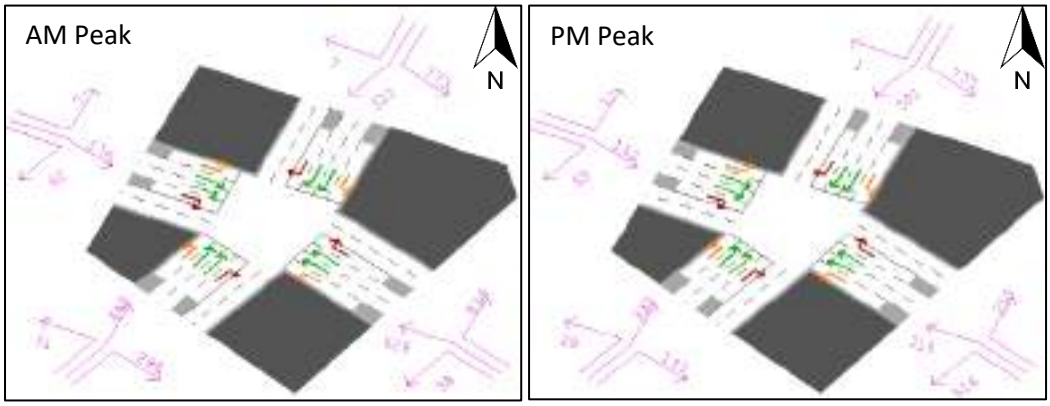
(n) Intersection 14: Harvey Road & Rhodes Avenue

All approaches are currently operating at acceptable LOS during both AM and PM peak hours. Turning flows are shown in the Figure below:



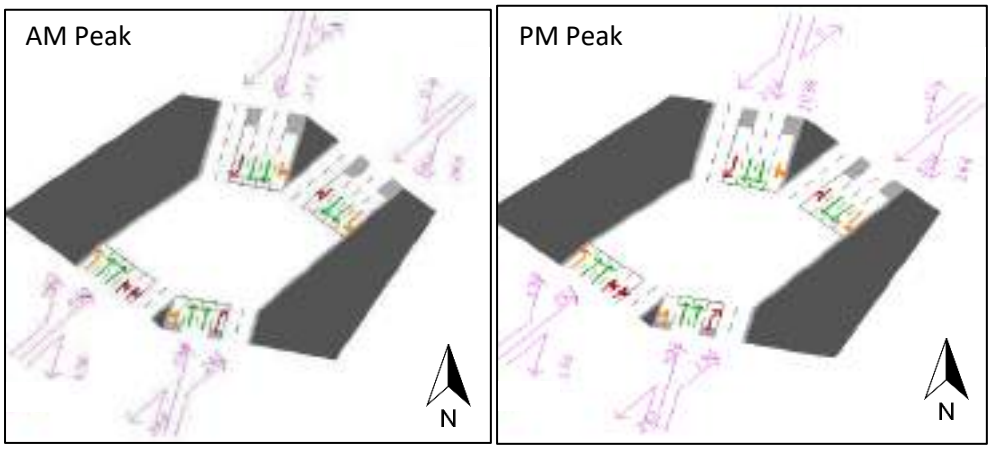
(o) Intersection 15: Harvey Road & Fort Hare Road

The east approach is currently operating at poor LOS E during the AM peak hour. Optimisation of the current signal plan will improve operations at this approach to LOS C as shown in the upgrades results table attached in Appendix C. Turning flows are shown in the Figure below:



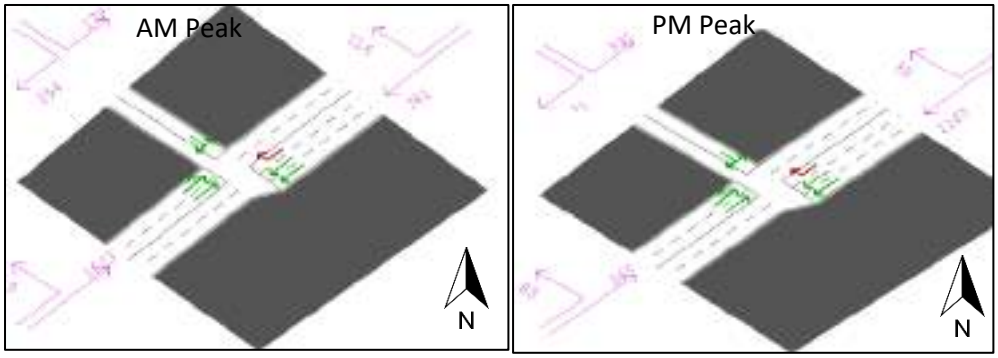
(p) Intersection 16: Harvey Road & OR Tambo

All approaches are currently operating at acceptable LOS during both AM and PM peak hours. Turning flows are shown in the Figure below:



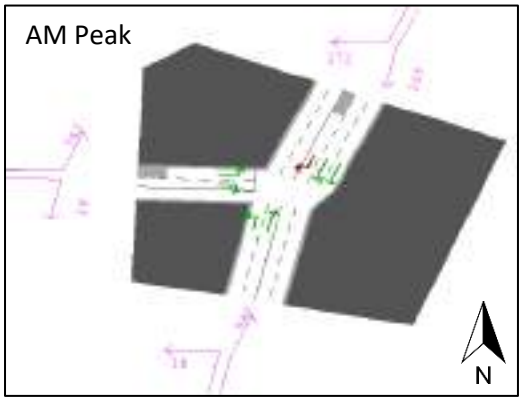
(q) Intersection 17: Monument & Hornby Street

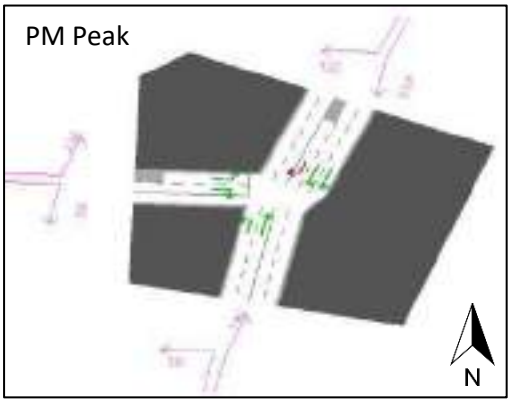
All approaches are currently operating at acceptable LOS during both AM and PM peak hours. Turning flows are shown in the Figure below:



(r) Intersection 18: Memoriam Road & De La Rey Avenue

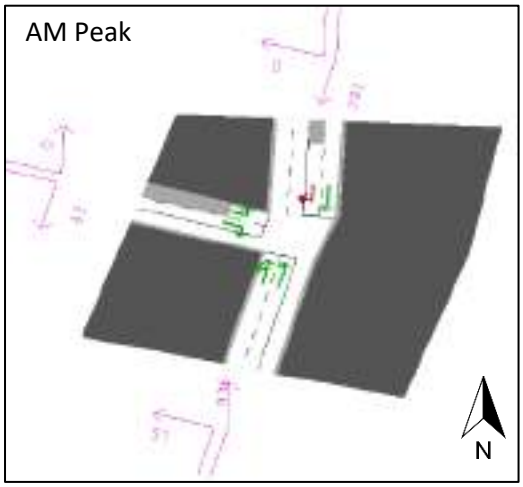
All approaches are currently operating at acceptable LOS during both AM and PM peak hours. Turning flows are shown in the Figure below:

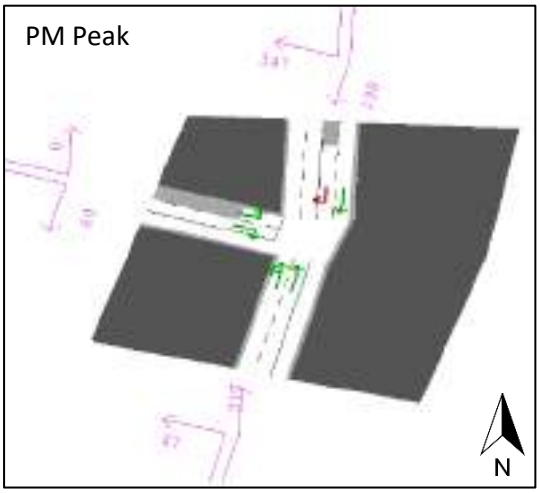




(s) Intersection 19: Ferreira Road & Helpmekaar Street

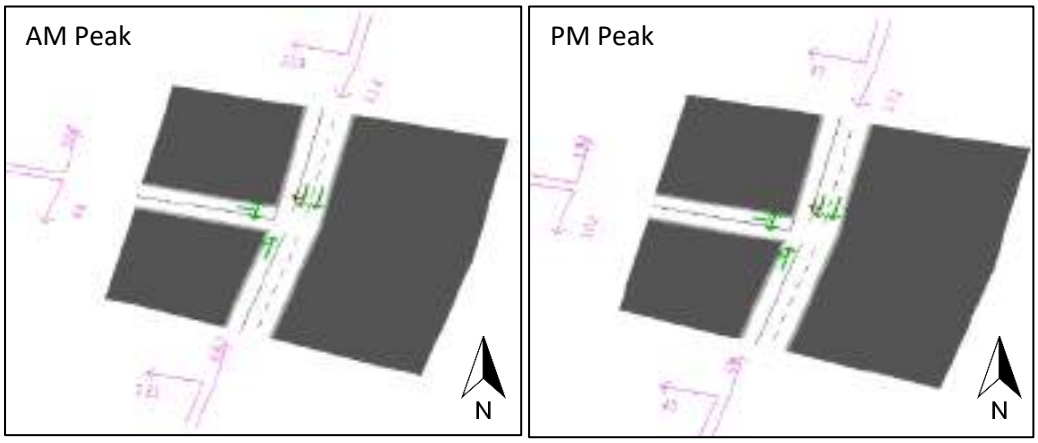
The west approach is currently operating at poor LOS F during the AM peak hour. A traffic signal is proposed at this intersection to improve operations for the west approach to LOS C as shown in the upgrades results table attached in Appendix C. Turning flows are shown in the Figure below:





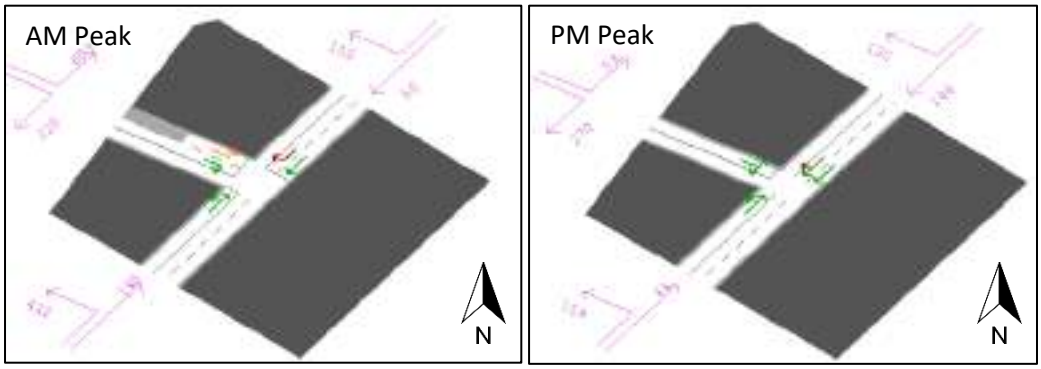
(t) Intersection 20: Ferreira Road & Burger Crescent

All approaches are currently operating at acceptable LOS during both AM and PM peak hours. Turning flows are shown in the Figure below:



(u) Intersection 21: Ferreira Road & Generaal Brand Drive

The west approach is currently operating at poor LOS F during the AM peak hour. A traffic signal is proposed to improve operations at this intersection as shown in the upgrades results in Appendix C. Turning flows are shown in the Figure below:



(v) Intersection 22: Ferreira Road & Vereeniging Drive

The west approach is currently operating at poor LOS F during the AM peak hour. A grade separated interchange to be implemented in near future will help resolve short comings at this intersection. The proposed interchange is shown in Appendix H.

(w) Intersection 23: Ferreira Road & Road to Ehrlich Park

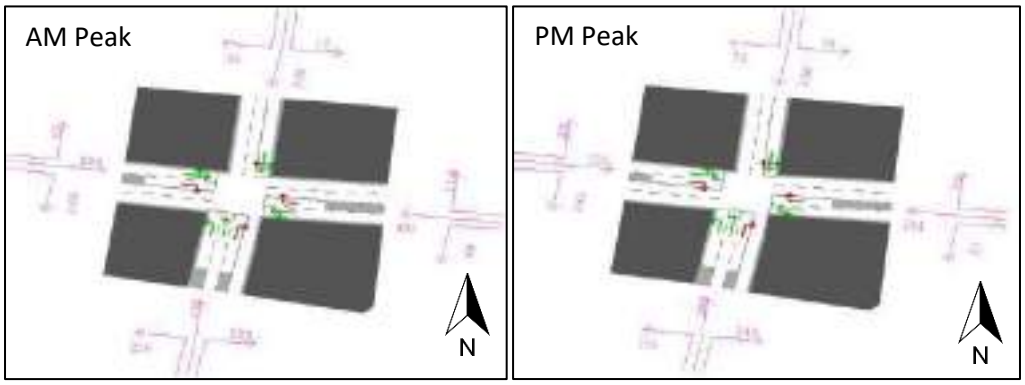
The east approach is currently operating at poor LOS E during the AM peak hour. A grade separated interchange to be implemented in near future will help resolve short comings at this intersection. The proposed interchange is shown in Appendix H.

(x) Intersection 24: Road to Ehrlich Park & M10

All approaches are currently operating at acceptable LOS during both AM and PM peak hours. A grade separated interchange to be implemented in near future will help resolve short comings at this intersection. The proposed interchange is shown in Appendix H.

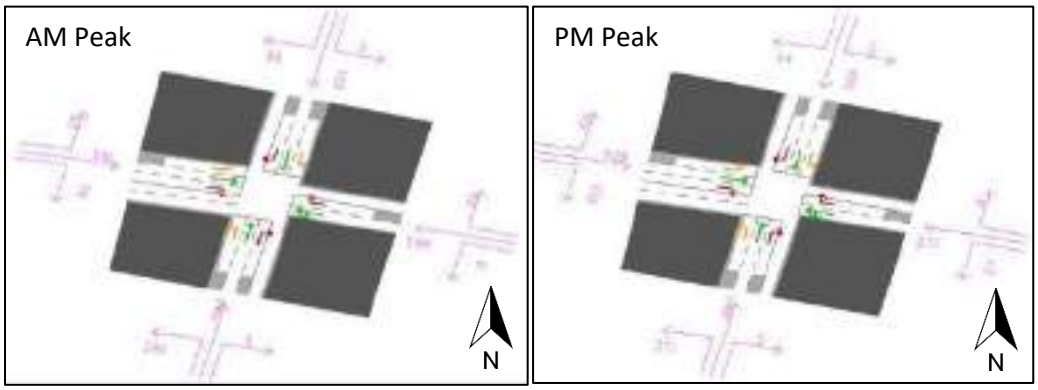
(y) Intersection 25: OR Tambo & St Georges Street

All approaches are currently operating at acceptable LOS during both AM and PM peak hours. Turning flows are shown in the Figure below:



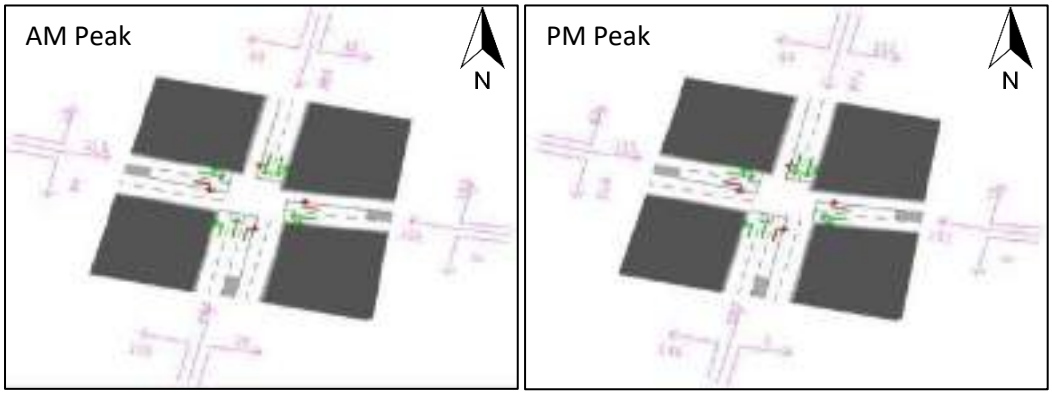
(z) Intersection 26: OR Tambo & Rhodes Avenue

All approaches are currently operating at acceptable LOS during both AM and PM peak hours. Turning flows are shown in the Figure below:



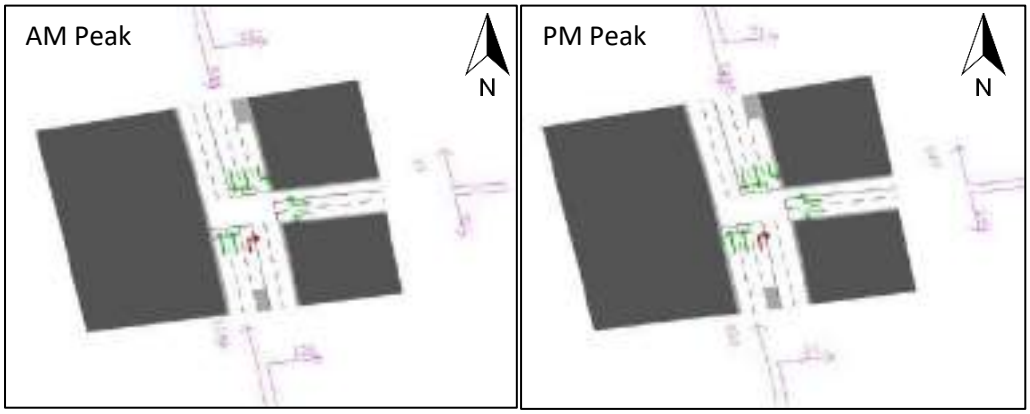
(aa) Intersection 27: OR Tambo & Falck Street

The east approach is currently operating at poor LOS F during the AM peak hour. Optimisation of the current signal plan will improve operations at this approach to LOS C as shown in the upgrades results table attached in Appendix C. Turning flows are shown in the Figure below:



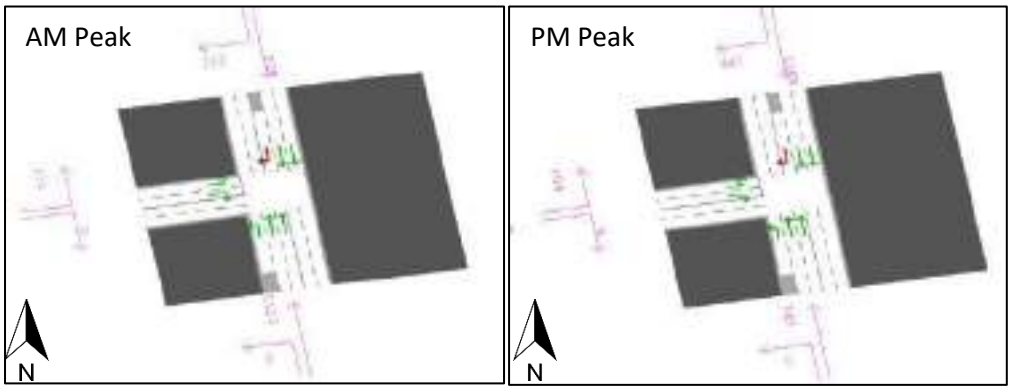
(bb) Intersection 28: OR Tambo & Vooruitsig Street

The north approach is currently operating at poor LOS F during the PM peak hour. Optimisation of the current signal plan will improve operations at this approach to LOS C as shown in the upgrades results table attached in Appendix C. Turning flows are shown in the Figure below:



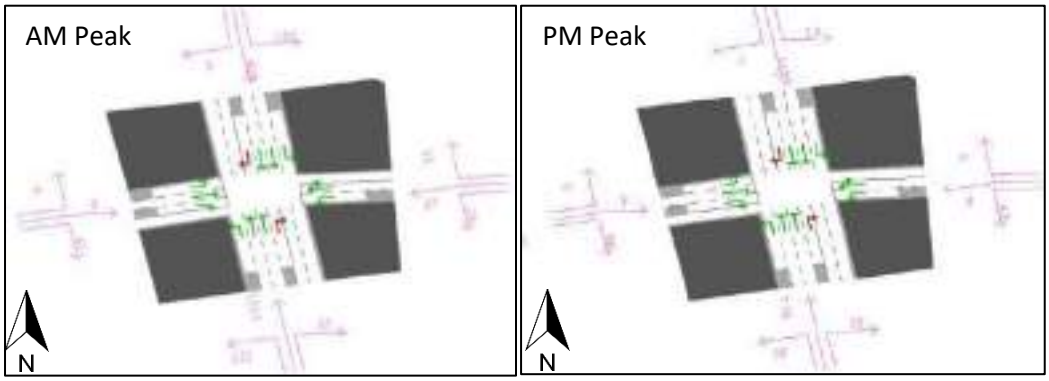
(cc) Intersection 29: OR Tambo & De Waal Road

All approaches are currently operating at acceptable LOS during both AM and PM peak hours. Turning flows are shown in the Figure below:



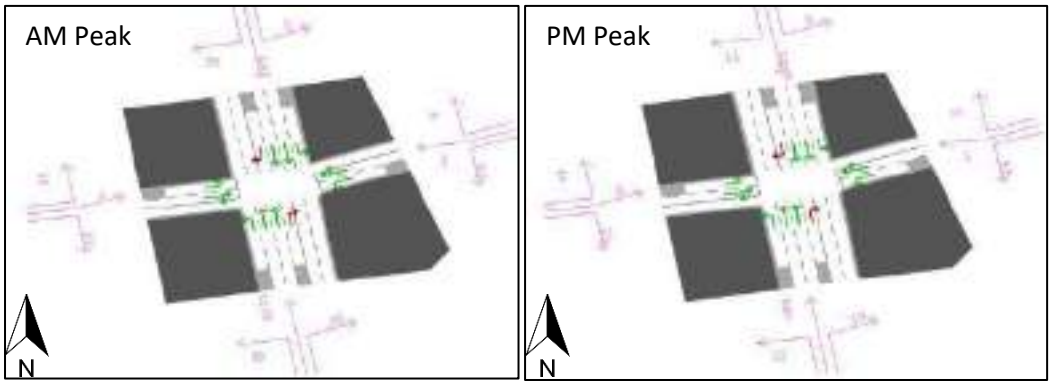
(dd) Intersection 30: OR Tambo & Gutsche Street

All approaches are currently operating at acceptable LOS during both AM and PM peak hours. Turning flows are shown in the Figure below:



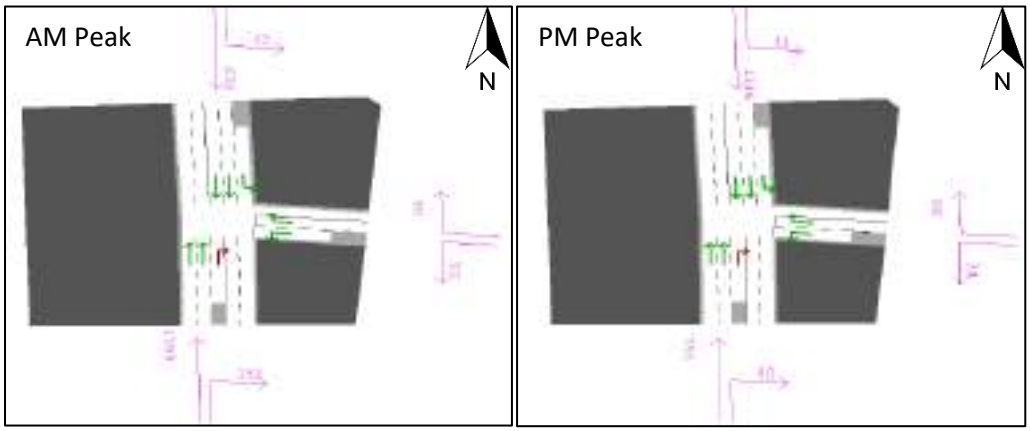
(ee) Intersection 31: OR Tambo & Hartley Street

All approaches are currently operating at acceptable LOS during both AM and PM peak hours. Turning flows are shown in the Figure below:



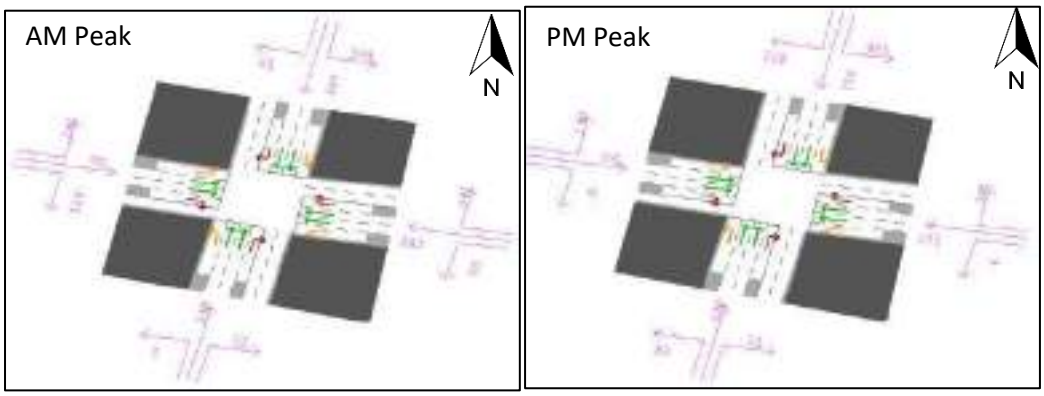
(ff) Intersection 32: OR Tambo & Tannery Street

All approaches are currently operating at acceptable LOS during both AM and PM peak hours. Turning flows are shown in the Figure below:



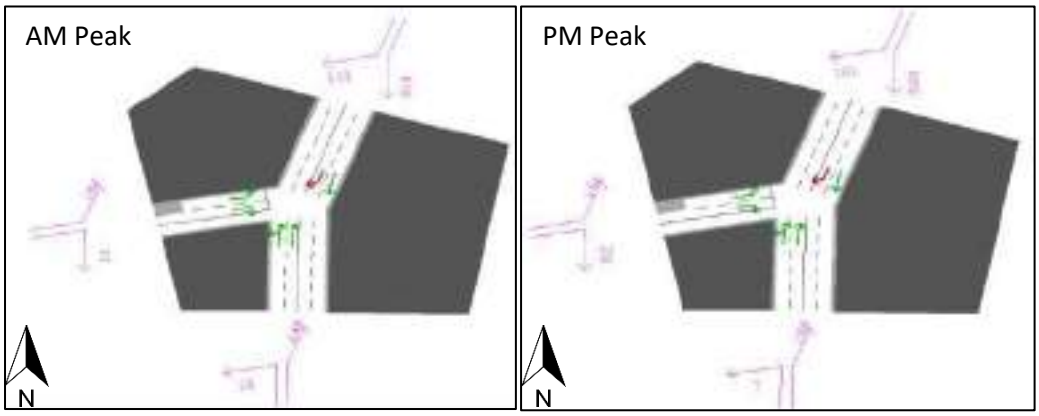
(gg) Intersection 33: OR Tambo & M10

All approaches are currently operating at acceptable LOS during both AM and PM peak hours. Turning flows are shown in the Figure below:



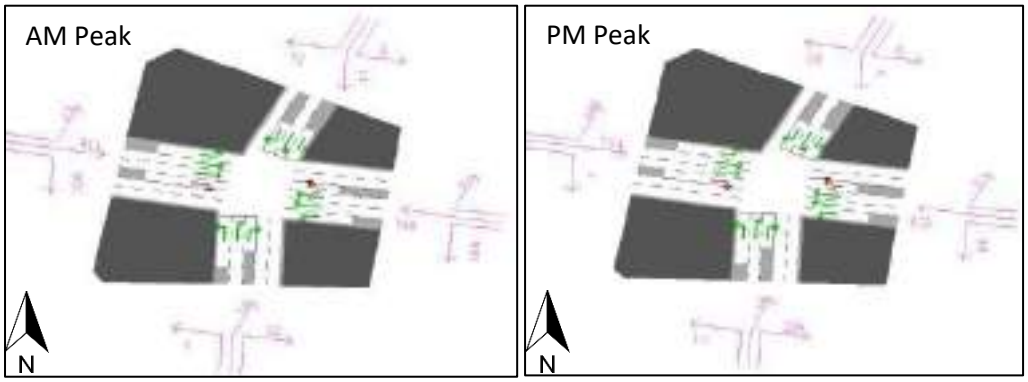
(hh) Intersection 34: OR Tambo & Link Road

All approaches are currently operating at acceptable LOS during both AM and PM peak hours. Turning flows are shown in the Figure below:



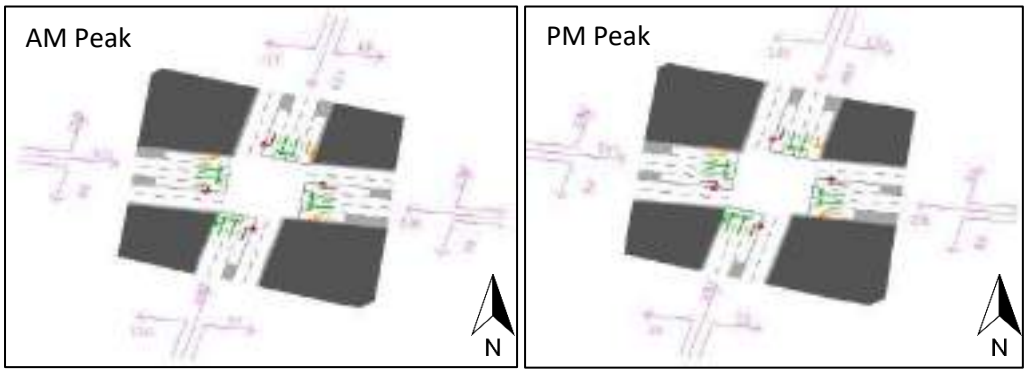
(ii) Intersection 35:M10 & Piet Human Street

All approaches are currently operating at acceptable LOS during both AM and PM peak hours. Turning flows are shown in the Figure below:



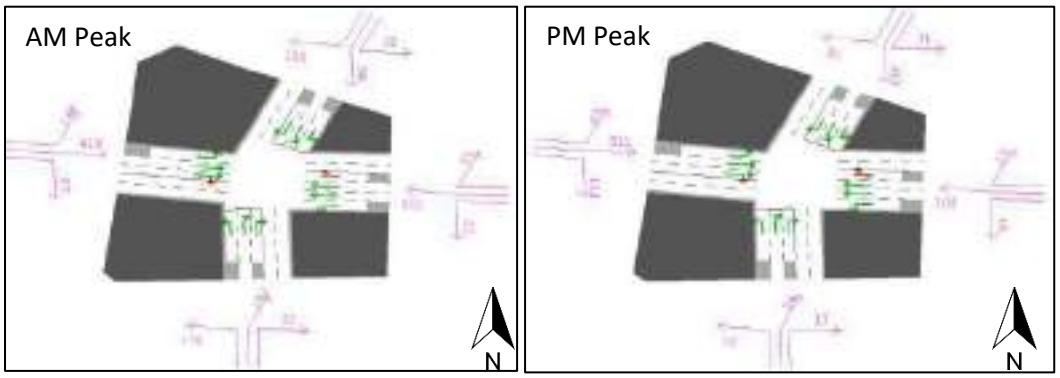
(jj) Intersection 36: M10 & Moshoeshoe Street

All approaches are currently operating at acceptable LOS during both AM and PM peak hours. Turning flows are shown in the Figure below:



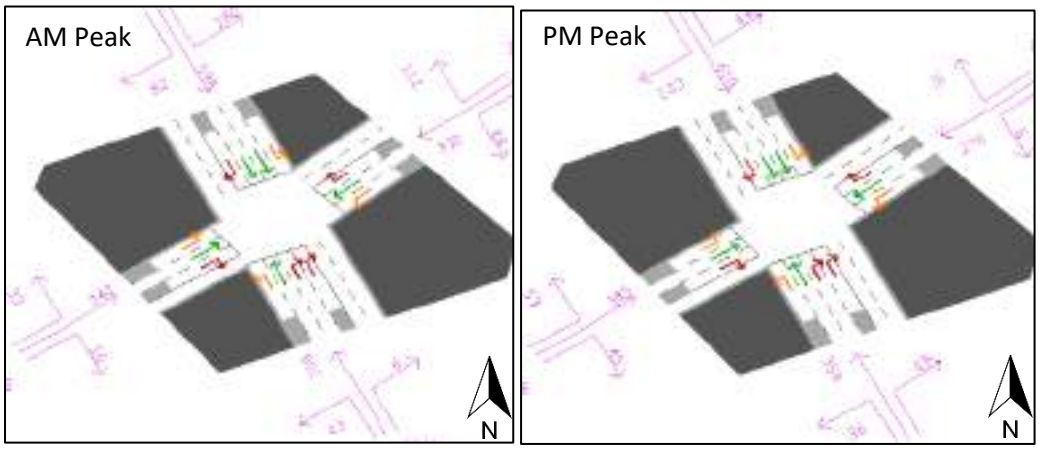
(kk) Intersection 37: M10 & Singonzo Street

All approaches are currently operating at acceptable LOS during both AM and PM peak hours. Turning flows are shown in the Figure below:



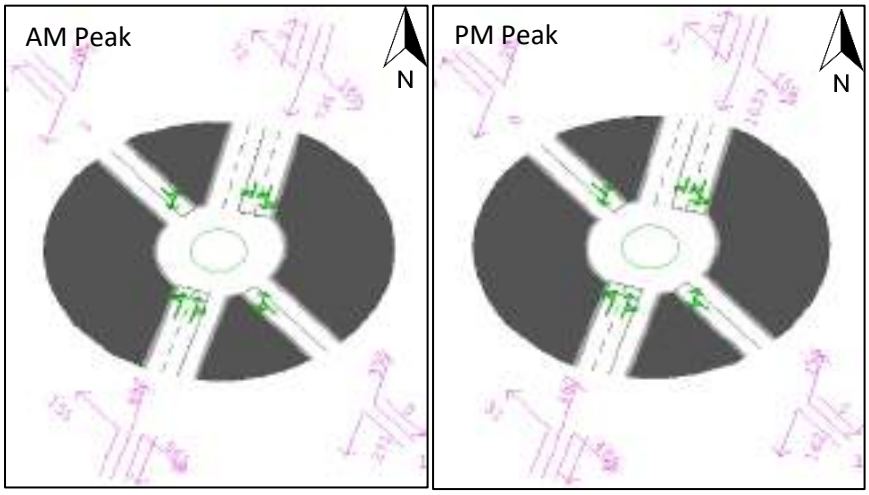
(ll) Intersection 38: M10 & Dr Belcher Road

All approaches are currently operating at acceptable LOS during both AM and PM peak hours. Turning flows are shown in the Figure below:



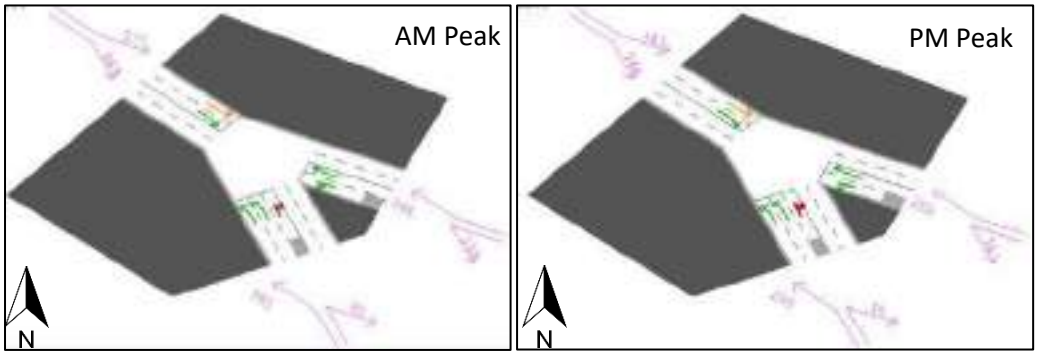
(mm) Intersection 39: Dr Belcher & Hamilton Road

The east approach is currently operating at poor LOS F during the AM peak hour and the PM peak hour. A SMEC designed solution of a grade separated intersection encompassing a roundabout is proposed to improve operations to LOS B for the west approach as shown in the upgrades results. The proposed solution is shown Appendix I. Turning flows are shown in the Figure below:



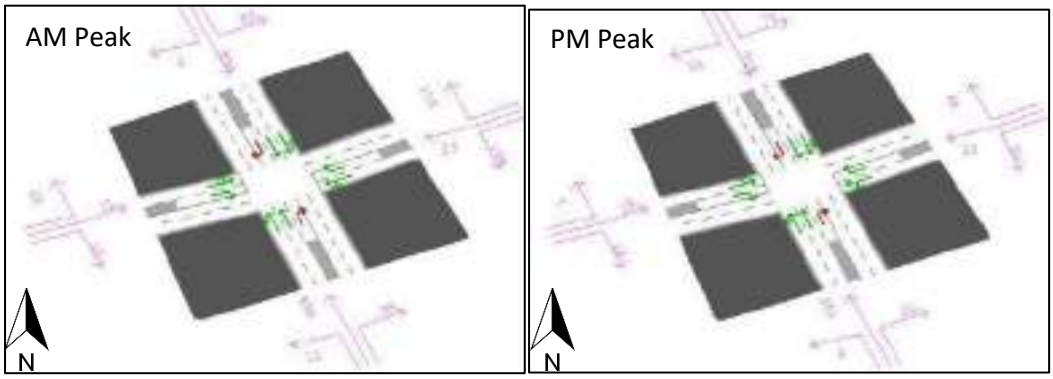
(nn) Intersection 40: Dr Belcher & Heatherdale Road

The east approach is currently operating at poor LOS F during the AM peak hour. Optimisation of the current signal plan will improve operations at this approach to LOS C as shown in the upgrades results table attached in Appendix C. Turning flows are shown in the Figure below:



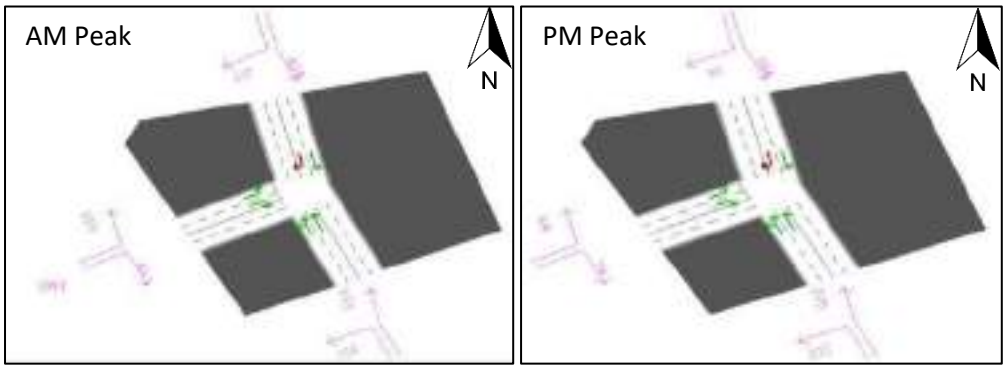
(oo) Intersection 41: Dr Belcher & Anna Maggerman Crescent

All approaches are currently operating at acceptable LOS during both AM and PM peak hours. Turning flows are shown in the Figure below:



(pp) Intersection 42: Dr Belcher & Monapi Street

All approaches are currently operating at acceptable LOS during both AM and PM peak hours. Turning flows are shown in the Figure below:



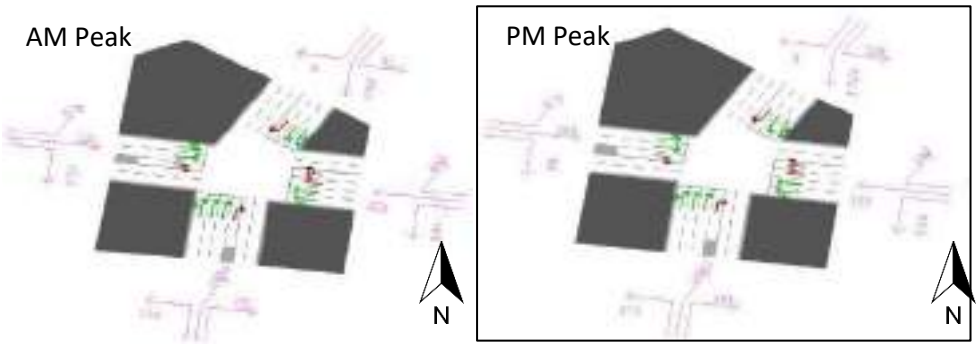
5.2 Mid-term 2022 + Latent Rights

This scenario analysis was undertaken in order to determine the traffic impact of all approved, but not yet built development's (Latent Rights) within the study area plus the Vista Park 1, 2 and Hillside View development's traffic. The analysis is used to compare what upgardes are required due to the latent rights excluding the proposed development. Detailed capacity analysis results and link flows in vehicles per hour, for the Mid-term 2022 + Latent Rights, are shown in Appendix E. This analysis did not include the trips generated by the Klipfontein Development.

(a) Intersection 1: President Boshof Street & St Georges Street

The east approach will be operating at poor LOS F during the AM peak hour. The west approach will be operating at poor LOS E during the PM peak hour and the north approach will be operating at a LOS F during the PM peak hour.

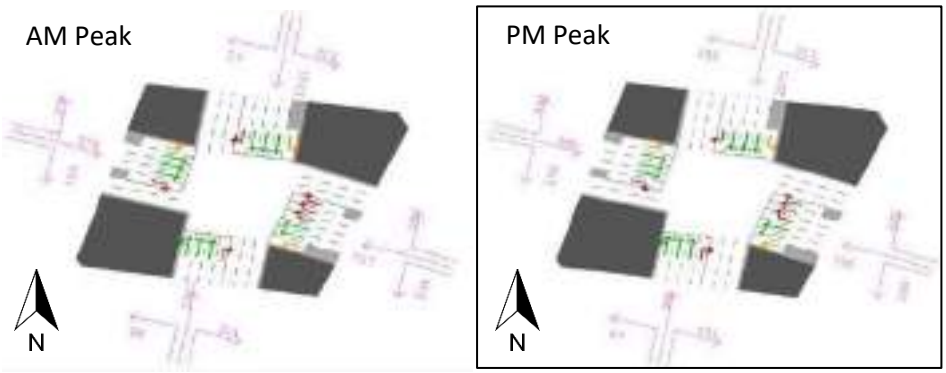
A short additional right turn lane is proposed on the east approach to improve capacity operations at this intersection. Turning flows are shown in the Figure below:



(b) Intersection 2: Kolbe Avenue & President Avenue

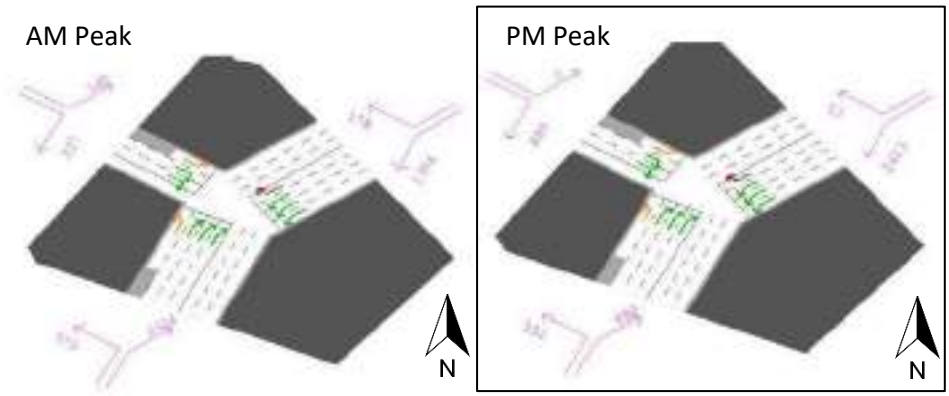
The east approach will be operating at poor LOS F during the AM peak hour. The west approach will be operating at poor LOS F during the PM peak hour and the north approach will be operating at a LOS F during the PM peak hour.

An additional through lane on the west approach, a third short right turn lane on the east approach and a short additional through lanes on the north approach are proposed to improve capacity operations at this intersection. Turning flows are shown in the Figure below:



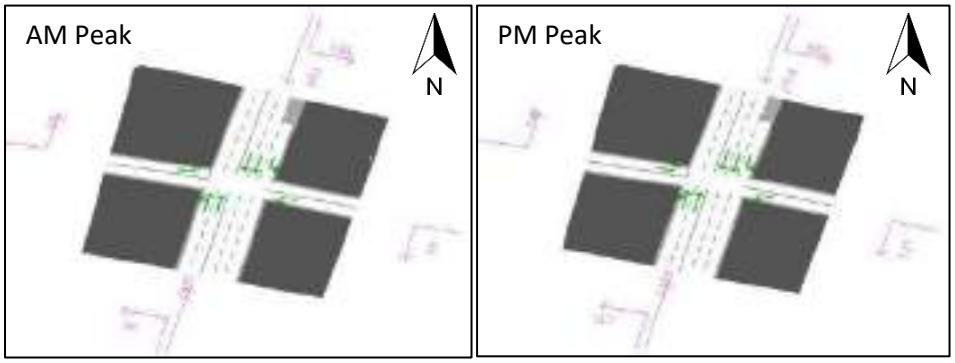
(c) Intersection 3: Kolbe Avenue & Roth Avenue

All approaches will be operating at acceptable LOS during both AM and PM peak hours. Turning flows are shown in the Figure below:



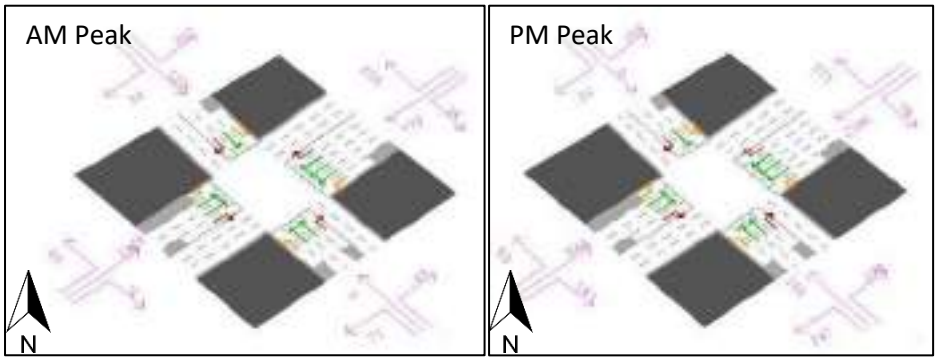
(d) Intersection 4: Curie Avenue & Nico Van Der Merwe

All approaches will be operating at acceptable LOS during both AM and PM peak hours. Turning flows are shown in the Figure below:



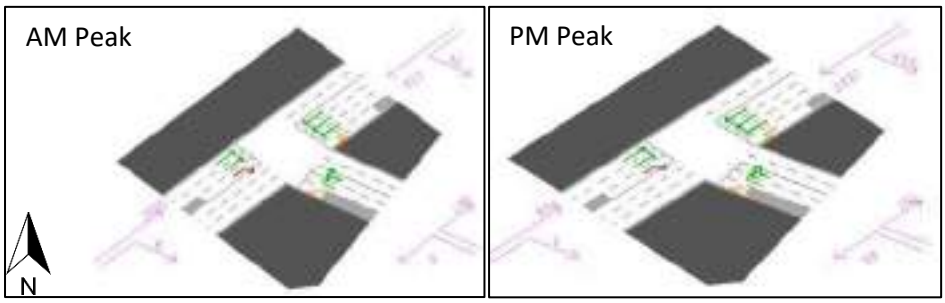
(e) Intersection 5: Curie Avenue & Pasteur Avenue

The west approach will be operating at poor LOS E during the AM peak hour. The north approach will be operating at poor LOS F during the AM peak hour. Signal optimisation is expected to improve operations at this intersection. Turning flows are shown in the Figure below:



(f) Intersection 6: Curie Avenue & Sannaspos Road

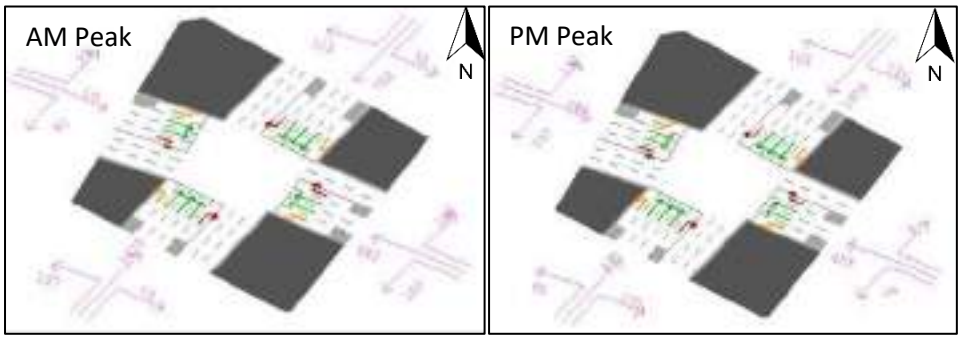
The south approach will be operating at poor LOS E during both the AM peak hour and the PM peak hour. An additional short 120m through lane is proposed on the north approach to free up green time for the turning traffic into Sannaspos Road. Turning flows are shown in the Figure below:



(g) Intersection 7: Curie Avenue & General De La Rey

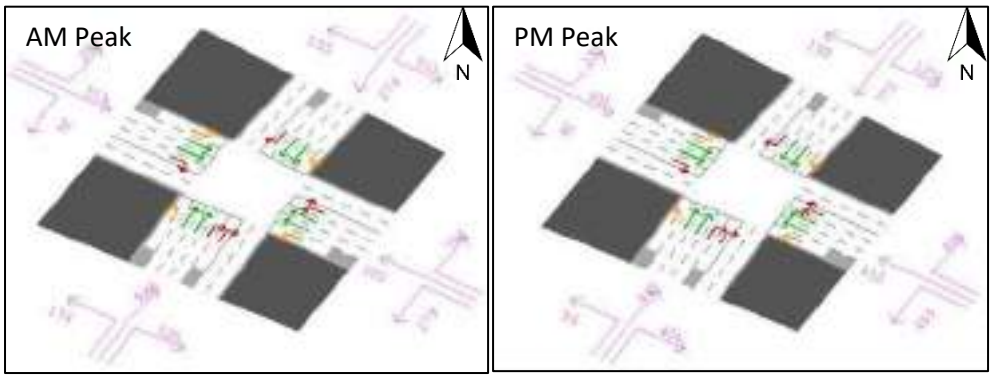
The south approach will be operating at poor LOS E during the AM peak hour. The north approach will be operating at poor LOS F during the PM peak hour. Additional through lanes on both the north and south approaches are proposed. The proposed upgrades are

expected to improve operations at this intersection. Turning flows are shown in the Figure below:



(h) Intersection 8: Curie Avenue & Vereeniging Drive

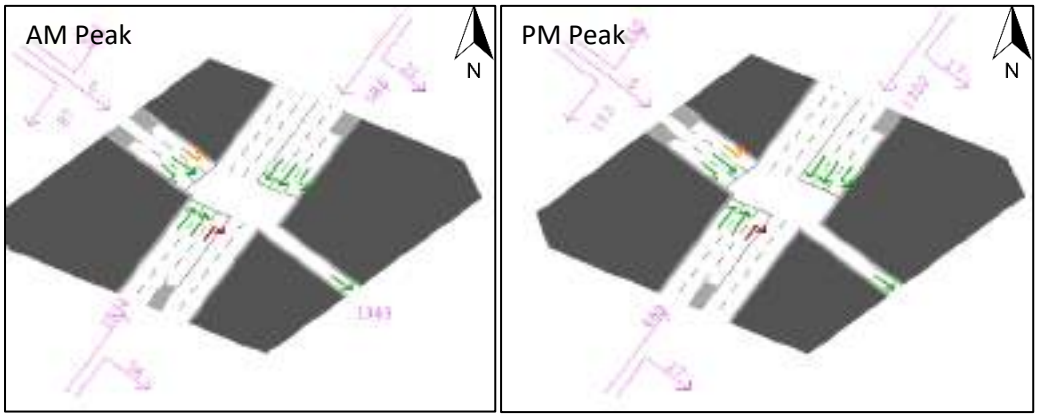
The east approach will be operating at poor LOS F during the PM peak hour. Signal optimisation is expected to improve operations at this intersection. Turning flows are shown in the Figure below:



(i) Intersection 9: N1 & Curie Avenue Off Ramp (Northern Quadrant)

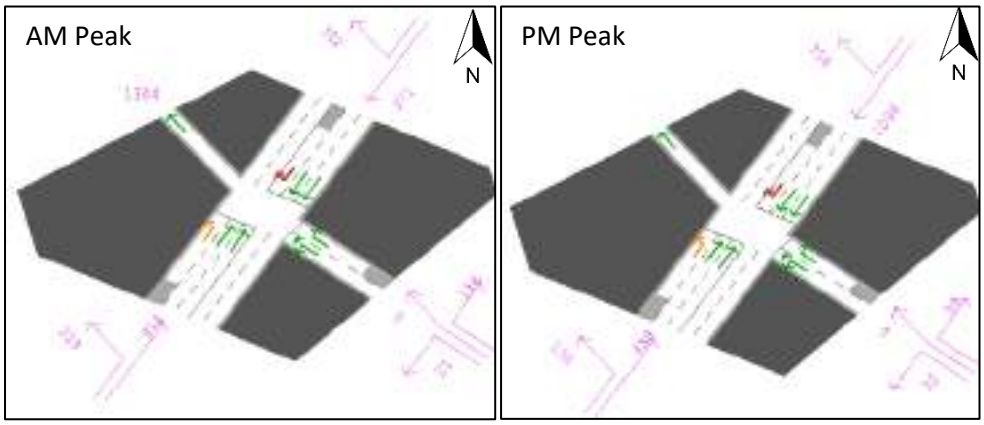
The west approach will be operating at poor LOS F during the AM peak hour.

A short 60m slip lane is proposed on the west approach. Turning flows are shown in the Figure below:



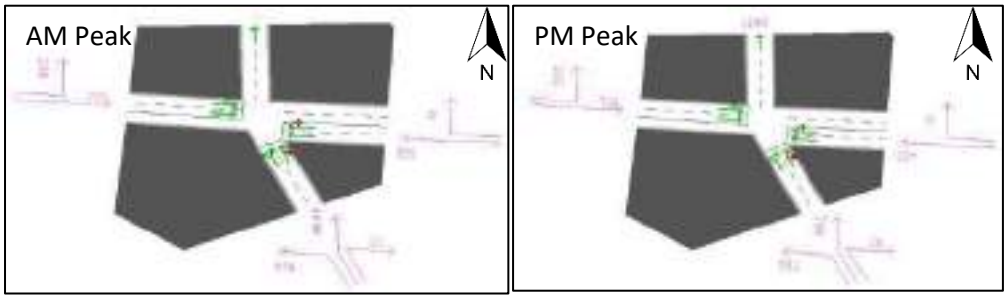
(j) Intersection 10: N1 & Curie Avenue Off Ramp (Southern Quadrant)

All approaches will be operating at acceptable LOS during both AM and PM peak hours. Turning flows are shown in the Figure below:



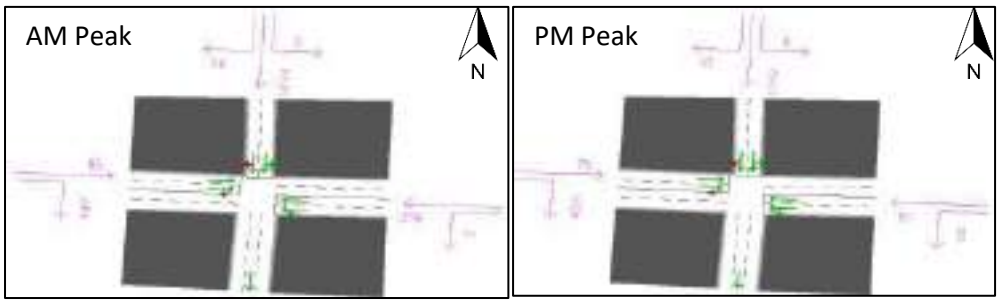
(k) Intersection 11: St Georges & Hanger Street

All approaches will be operating at acceptable LOS during both AM and PM peak hours. Turning flows are shown in the Figure below:



(l) Intersection 12: St Georges & Harvey Road

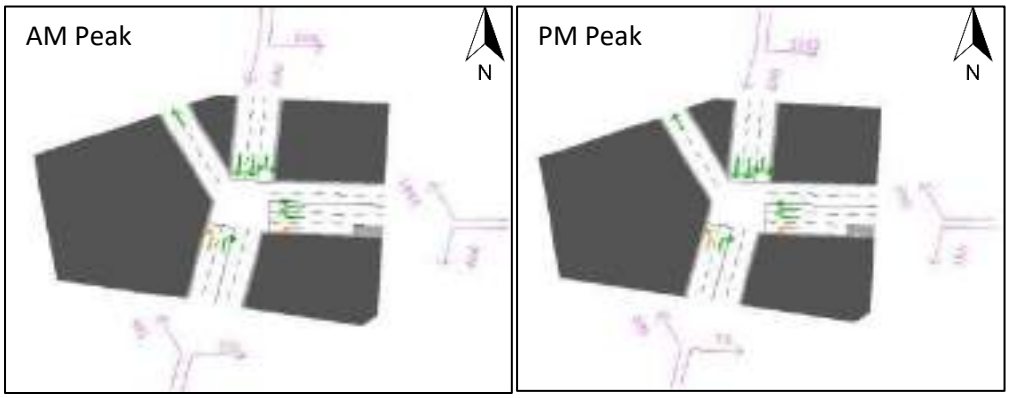
All approaches will be operating at acceptable LOS during both AM and PM peak hours. Turning flows are shown in the Figure below:



(m) Intersection 13: Harvey Road & Hanger & Fort Street

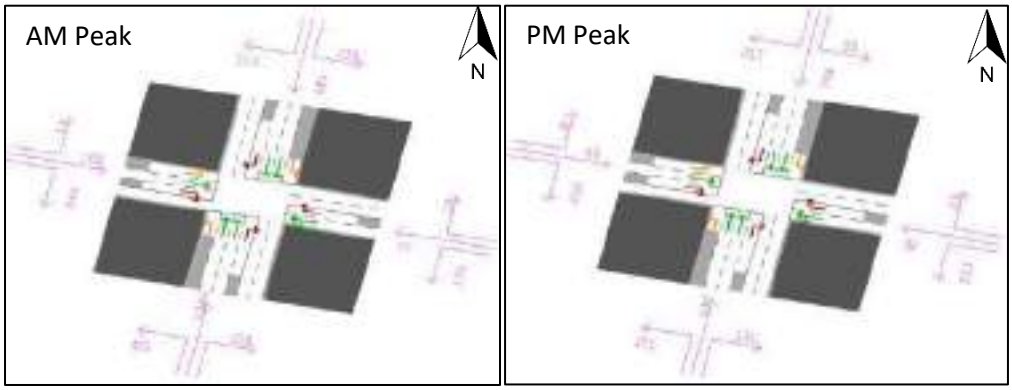
The north approach will be operating at poor LOS F during the AM peak hour and at LOS E during the PM peak hour. It is proposed that the first of the through lanes be shared

with the left so to increase flow for the left turn movement. Turning flows are shown in the Figure below:



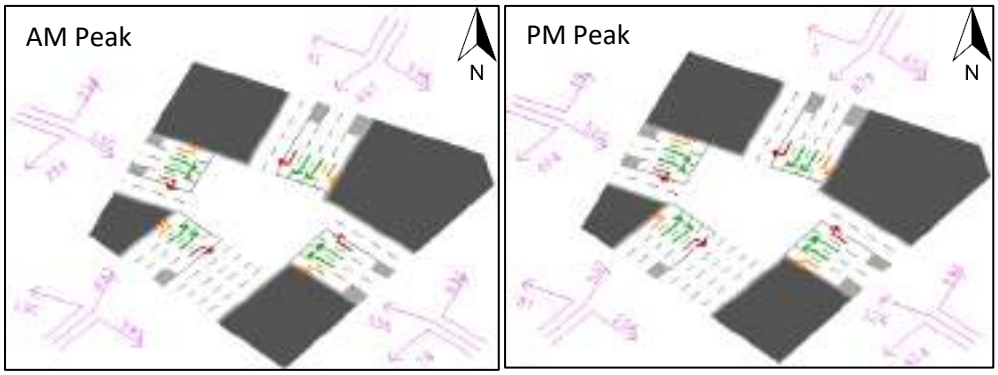
(n) Intersection 14: Harvey Road & Rhodes Avenue

The west approach will be operating at poor LOS E during the AM peak hour and at LOS F during the PM peak hour. No geometric upgrades are possible due to space constraints at this intersection. Turning flows are shown in the Figure below:



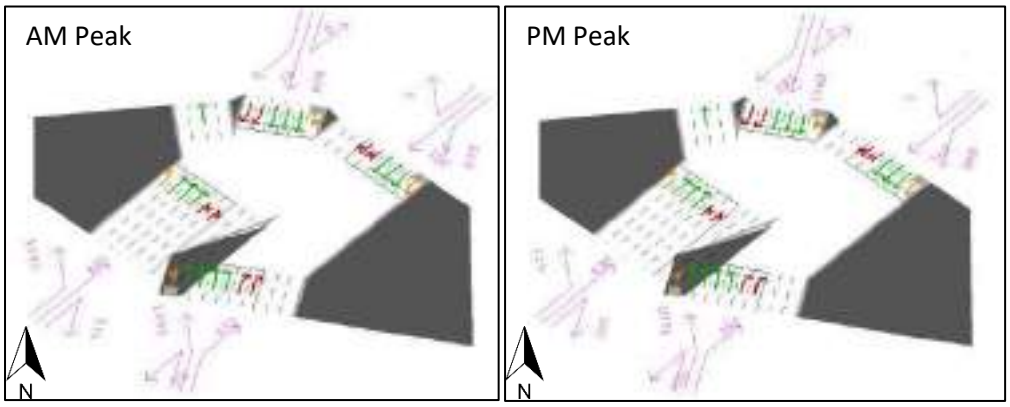
(o) Intersection 15: Harvey Road & Fort Hare Road

All approaches will be operating at acceptable LOS during both AM and PM peak hours. Turning flows are shown in the Figure below:



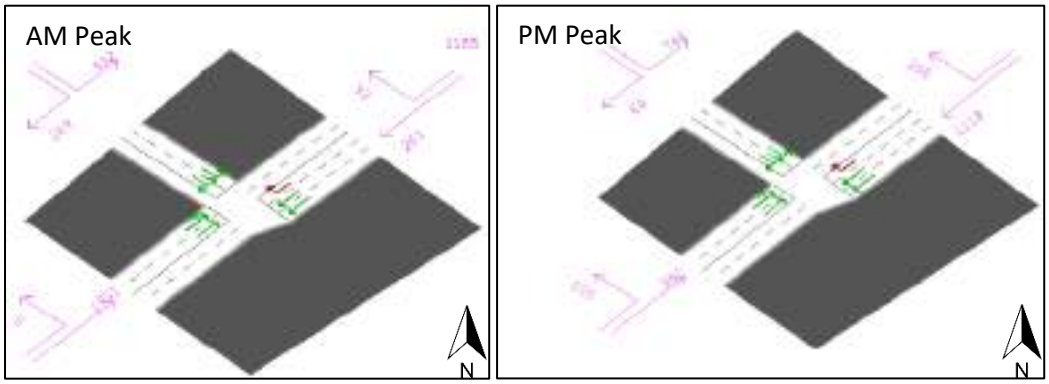
(p) Intersection 16: Harvey Road & OR Tambo

All approaches will be operating at acceptable LOS during both AM and PM peak hours. Turning flows are shown in the Figure below:



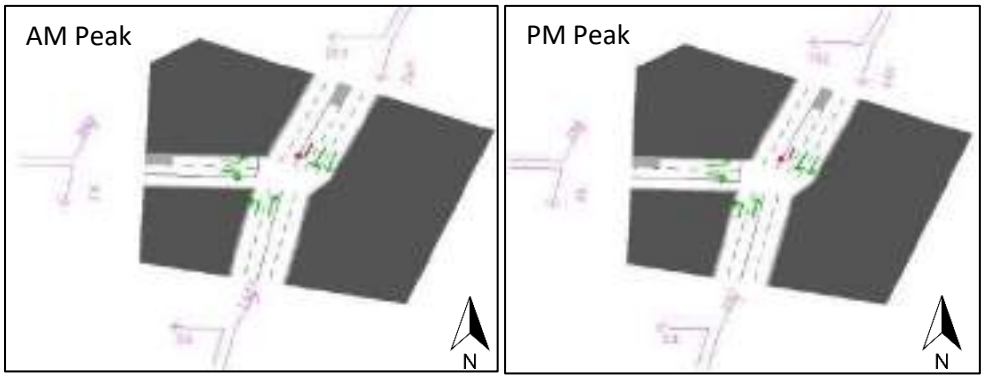
(q) Intersection 17: Monument & Hornby Street

The west approach will be operating at poor LOS E during the AM peak hour and at LOS F during the PM peak hour. A short 60m additional left turn lane is proposed on the west approach is proposed. Turning flows are shown in the Figure below:



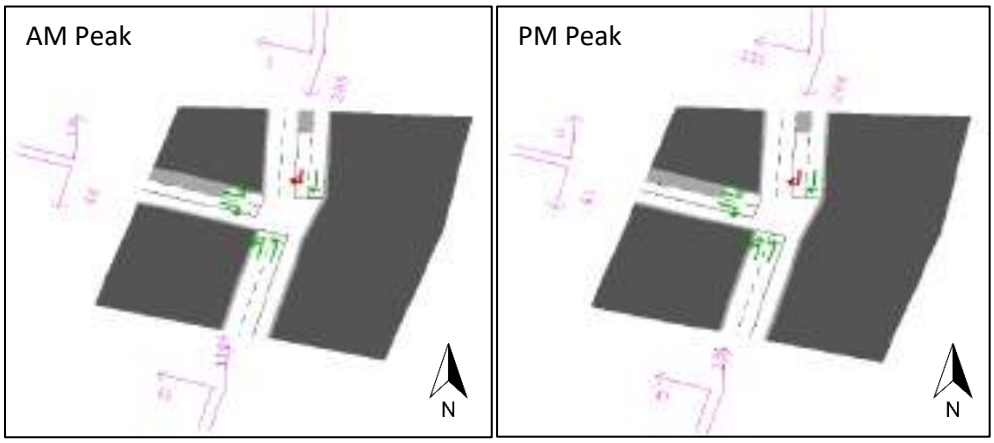
(r) Intersection 18: Memoriam Road & De La Rey Avenue

All approaches will be operating at acceptable LOS during both AM and PM peak hours. Turning flows are shown in the Figure below:



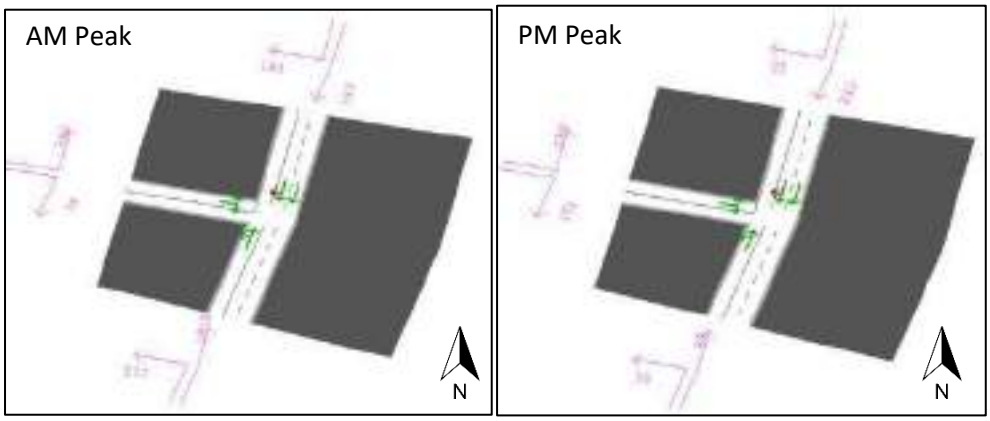
(s) Intersection 19: Ferreira Road & Helpmekaar Street

All approaches will be operating at acceptable LOS during both AM and PM peak hours. Turning flows are shown in the Figure below:



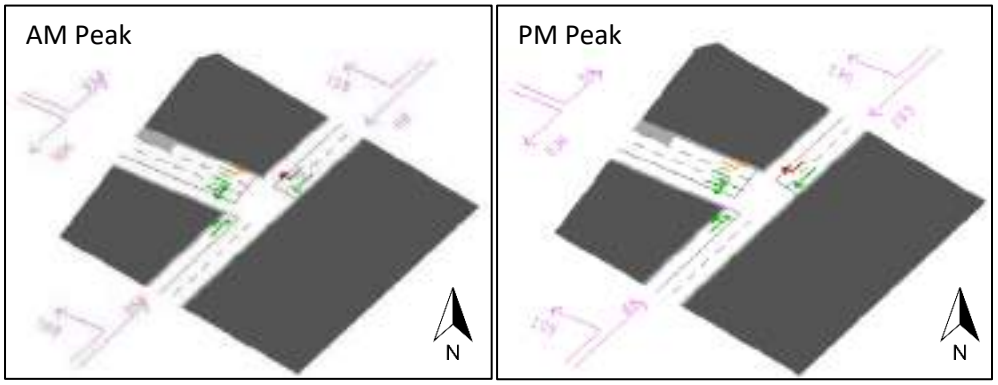
(t) Intersection 20: Ferreira Road & Burger Crescent

All approaches will be operating at acceptable LOS during both AM and PM peak hours. Turning flows are shown in the Figure below:



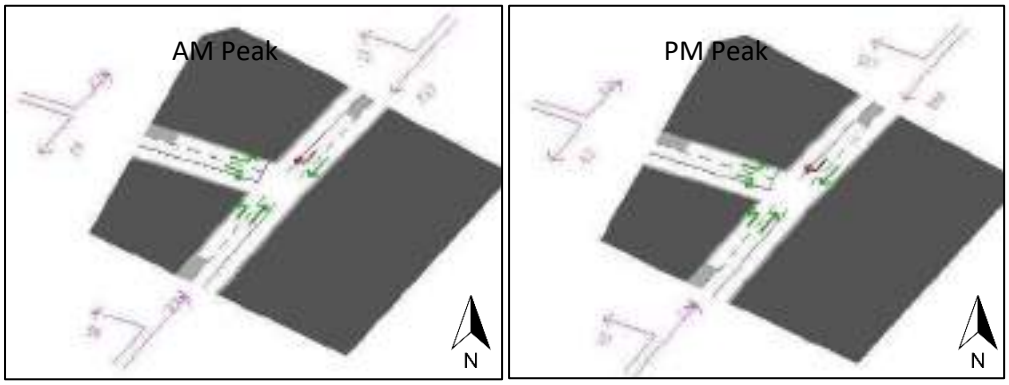
(u) Intersection 21: Ferreira Road & Generaal Brand Drive

The west approach will be operating at poor LOS F during the PM peak hour. Additional right turn lane is proposed on the west approach to improve capacity operations to LOS C. Turning flows are shown in the Figure below:



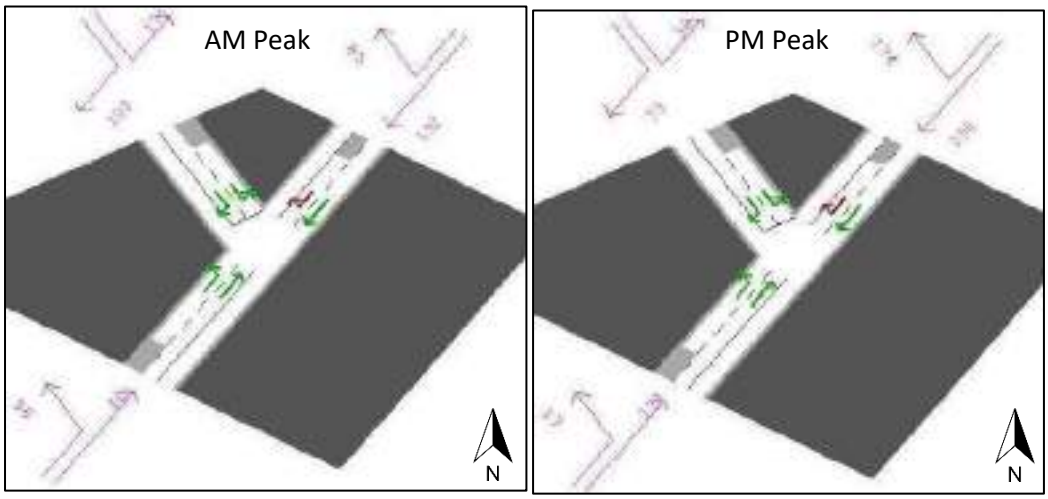
(v) Intersection 22: Ferreira Road & Vereeniging Drive (Northern Terminal)

All approaches will be operating at acceptable LOS during both AM and PM peak hours. Turning flows are shown in the Figure below:



(w) Intersection 23: Ferreira Road & Vereeniging (South Terminal)

All approaches will be operating at acceptable LOS during both AM and PM peak hours. Turning flows are shown in the Figure below:

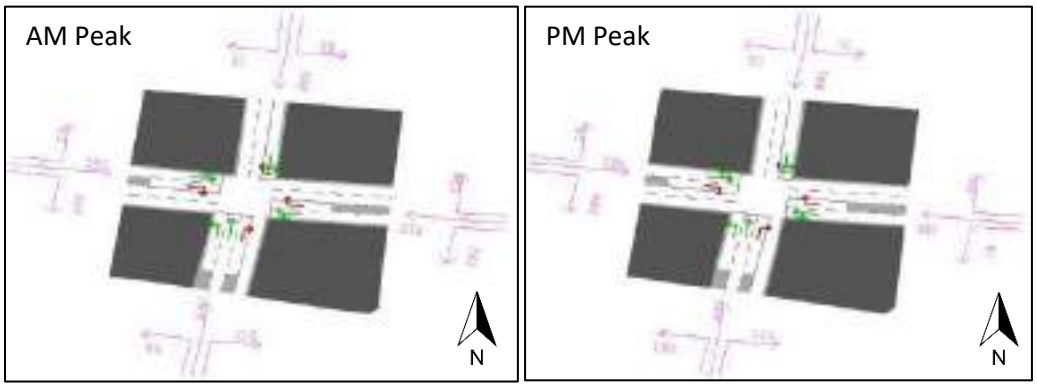


(x) Intersection 24: Road to Ehrlich Park & M10

N/A

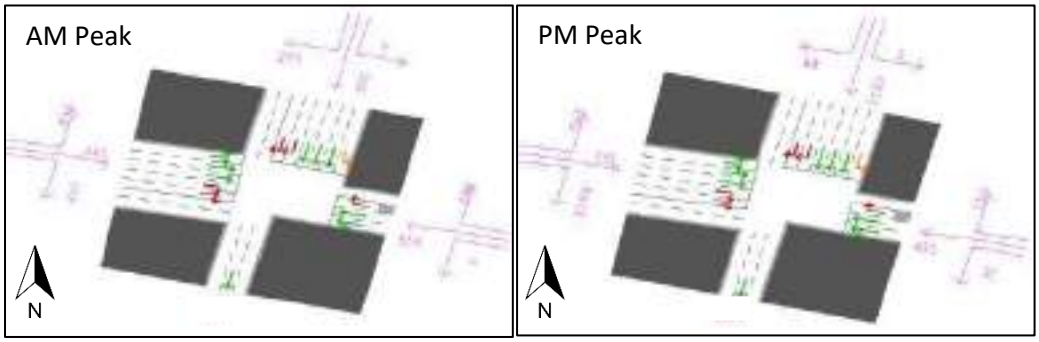
(y) Intersection 25: OR Tambo & St Georges Street

The east approach will be operating at poor LOS F during the AM peak hour. The north, west and east approaches will be operating at poor LOS F during the PM peak hour. No geometric upgrades are possible due to space constraints at this intersection. Turning flows are shown in the Figure below:



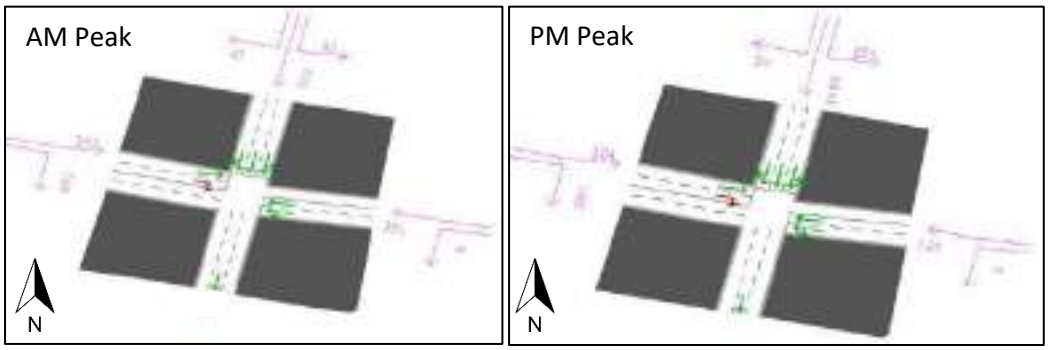
(z) Intersection 26: OR Tambo & Rhodes Avenue

The west approach will be operating at poor LOS F during the PM peak hour. The geometric layout shown below is proposed to improve capacity operations at this future intersection. Turning flows are shown in the Figure below:



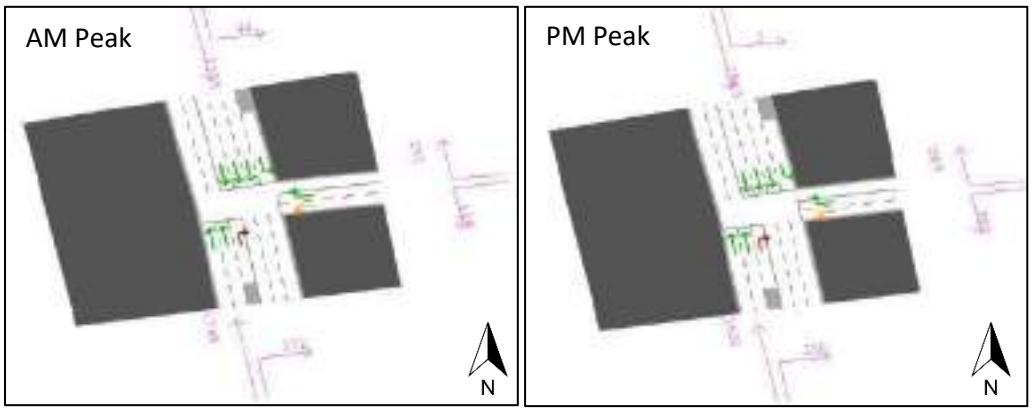
(aa) Intersection 27: OR Tambo & Falck Street

All approaches will be operating at acceptable LOS during both AM and PM peak hours. Turning flows are shown in the Figure below:



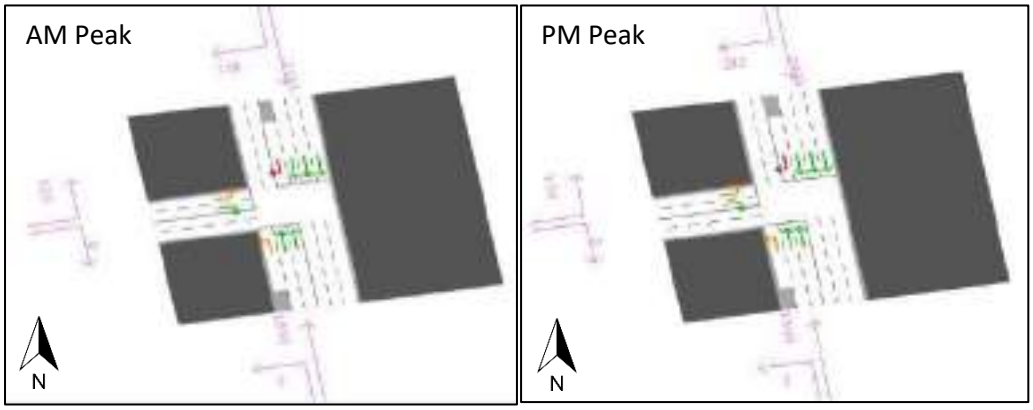
(bb) Intersection 28: OR Tambo & Vooruitsig Street

The east approach will be operating at poor LOS F during the PM peak hour. A third additional through southbound lane is proposed to improve capacity operations at this intersection. Turning flows are shown in the Figure below:



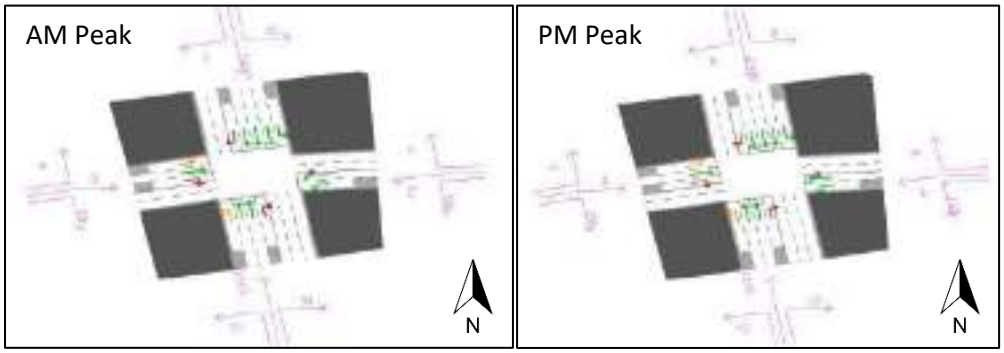
(cc) Intersection 29: OR Tambo & De Waal Road

The west approach will be operating at poor LOS F during the AM peak hour and at LOS E during the PM peak hour. A traffic signal coupled with a third additional through southbound lane is proposed at this intersection. Turning flows are shown in the Figure below:



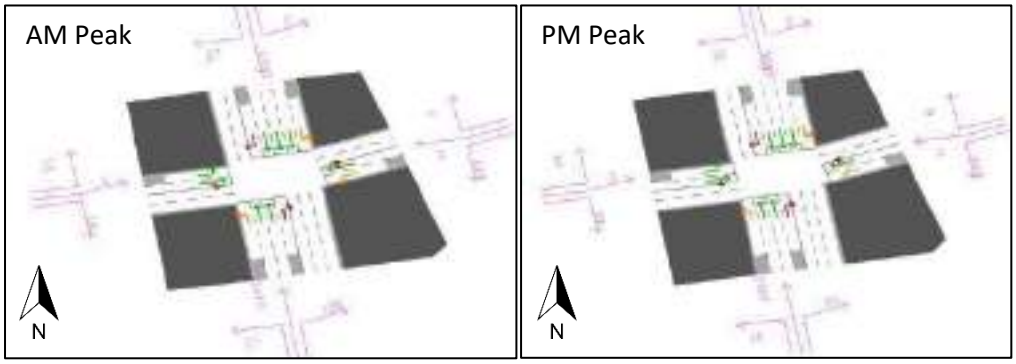
(dd) Intersection 30: OR Tambo & Gutsche Street

The west approach will be operating at poor LOS F during both the AM peak hour and the PM peak hour. The east approach will be operating at poor LOS E during the AM peak hour and at poor LOS F during the PM peak hour. A traffic signal coupled with a third additional through southbound lane is proposed at this intersection. Turning flows are shown in the Figure below:



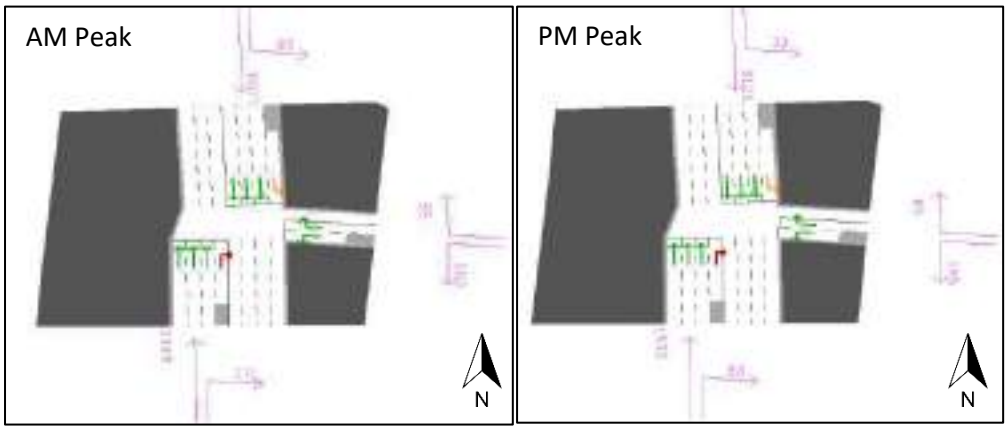
(ee) Intersection 31: OR Tambo & Hartley Street

The west approach will be operating at poor LOS F during the AM peak hour. The east approach will be operating at LOS E during the AM peak hour and at poor LOS F during the PM peak hour. A traffic signal coupled with a third additional through southbound lane is proposed at this intersection. Turning flows are shown in the Figure below:



(ff) Intersection 32: OR Tambo & Tannery Street

The south approach will be operating at LOS F during the AM peak hour and at poor LOS E during the PM peak hour. The east approach will be operating at LOS F during both the AM peak hour and the PM peak hour. A traffic signal coupled with third additional through southbound and northbound lanes is proposed at this intersection. Turning flows are shown in the Figure below:

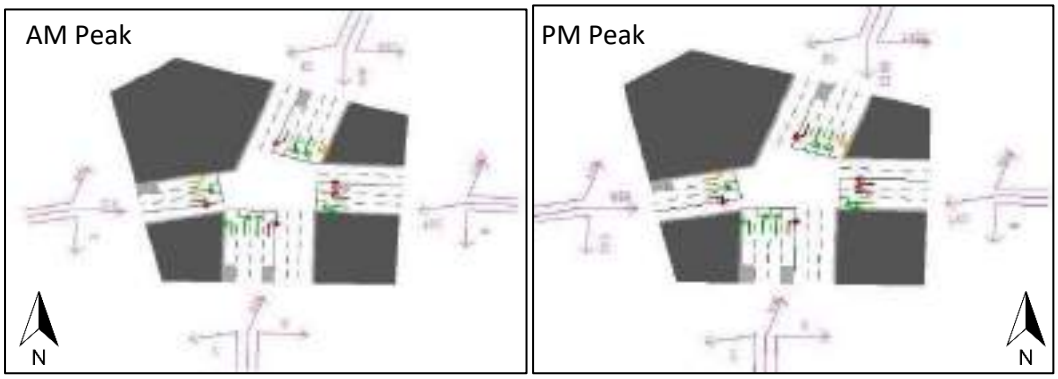


(gg) Intersection 33: OR Tambo & M10

This intersection will be converted to a switching interchange (Intersection 45 and Intersection 46). The proposed layout is shown in Appendix K.

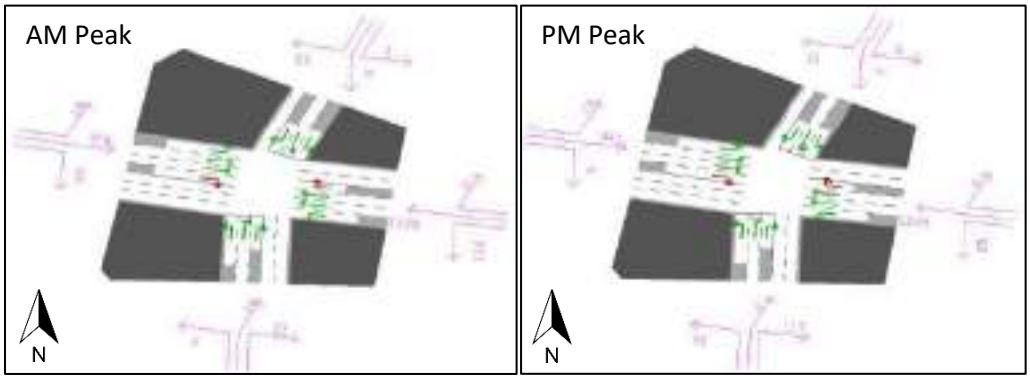
(hh) Intersection 34: OR Tambo & Link Road & Hillside View Access 1

The west approach will be operating at LOS F during the PM peak hour. In order to accommodate the proposed Hillside View Access 1, dual short right turn lanes are coupled with a shared through and left turn lane are proposed on the east approach. A slip lane on the north approach and a short 60m right turn lane on the south approach are proposed. Flows are shown in the Figure below:



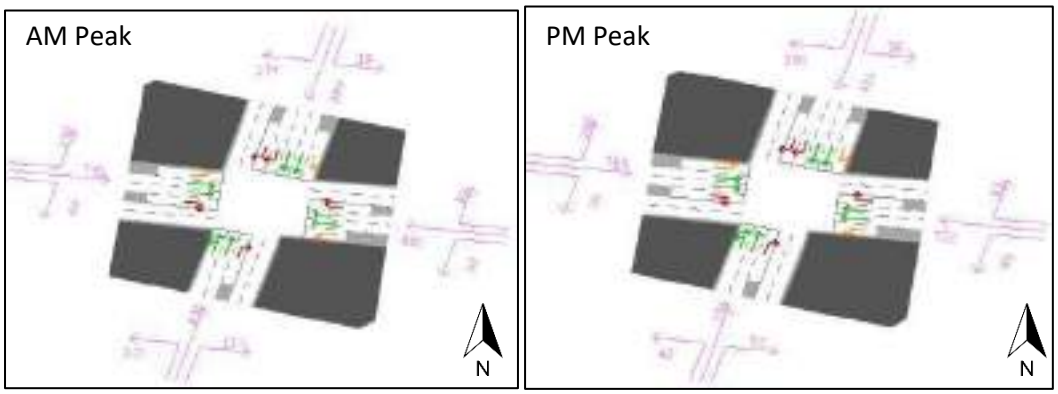
(ii) Intersection 35:M10 & Piet Human Street

The south approach will be operating at LOS E during both the AM peak hour and the PM peak hour. The north approach will be operating at LOS F during the AM peak hour. Turning flows are shown in the Figure below:



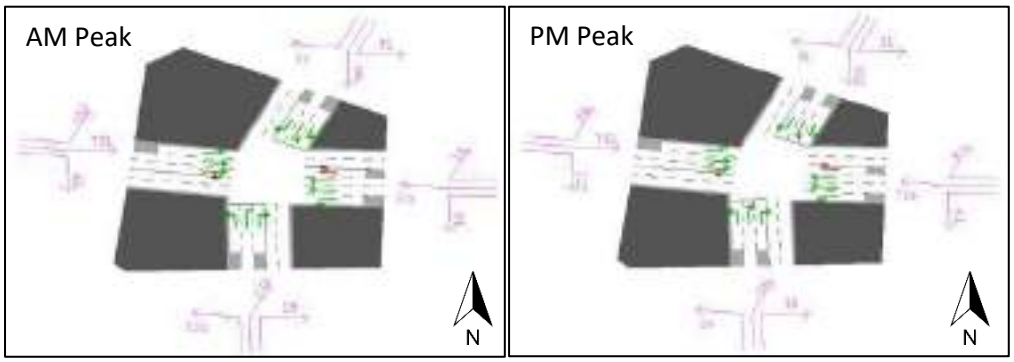
(jj) Intersection 36: M10 & Moshoeshoe Street

The north approach will be operating at LOS E during the PM peak hour. Turning flows are shown in the Figure below:



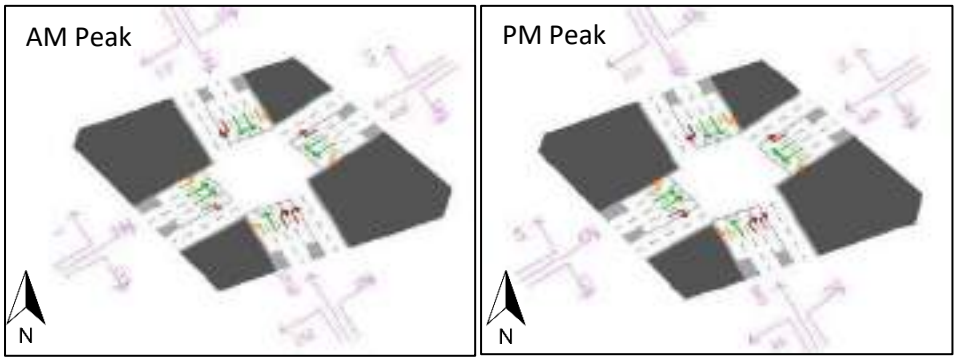
(kk) Intersection 37: M10 & Singonzo Street

The south approach will be operating at LOS F during the AM peak hour. Turning flows are shown in the Figure below:



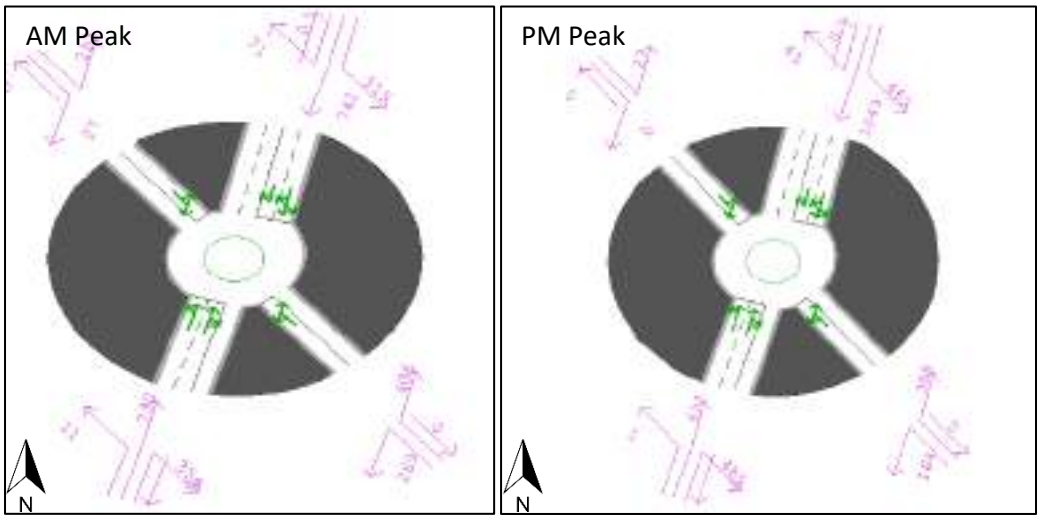
(ll) Intersection 38: M10 & Dr Belcher Road

The east approach will be operating at LOS F during both the AM peak hour and the PM peak hour. The west approach will be operating at LOS F during the PM peak hour. Short 60m additional through lanes are proposed on the east and west approaches. Turning flows are shown in the Figure below:



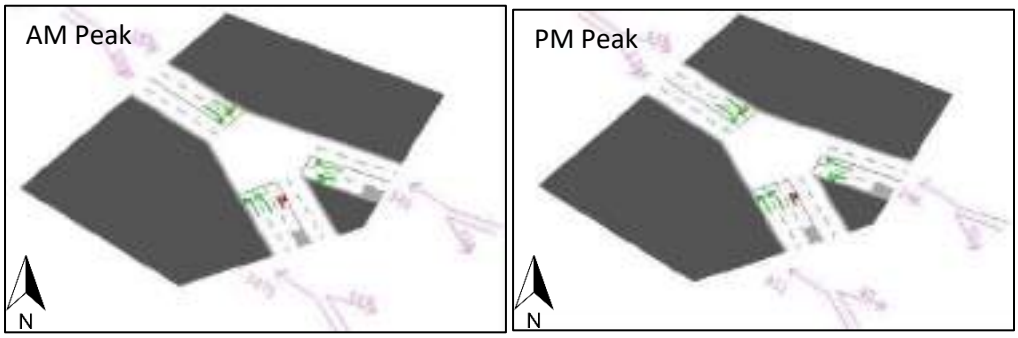
(mm) Intersection 39: Dr Belcher & Hamilton Road

All approaches will be operating at acceptable LOS during both AM and PM peak hours. Turning flows are shown in the Figure below:



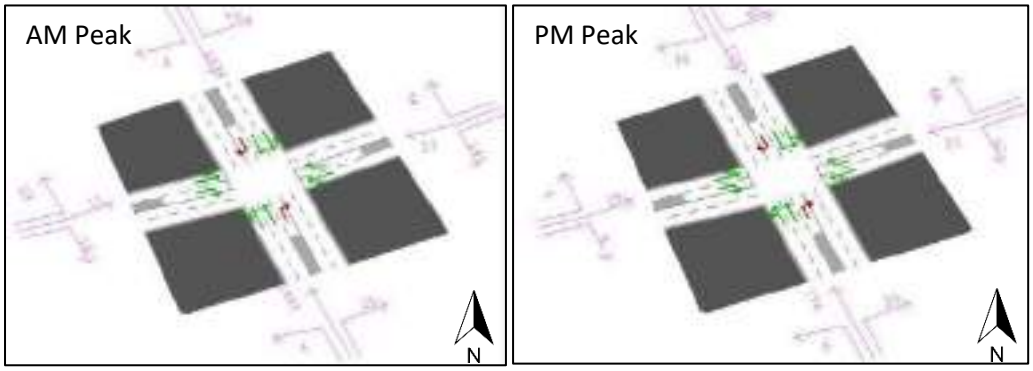
(nn) Intersection 40: Dr Belcher & Heatherdale Road

All approaches will be operating at acceptable LOS during both AM and PM peak hours. Turning flows are shown in the Figure below:



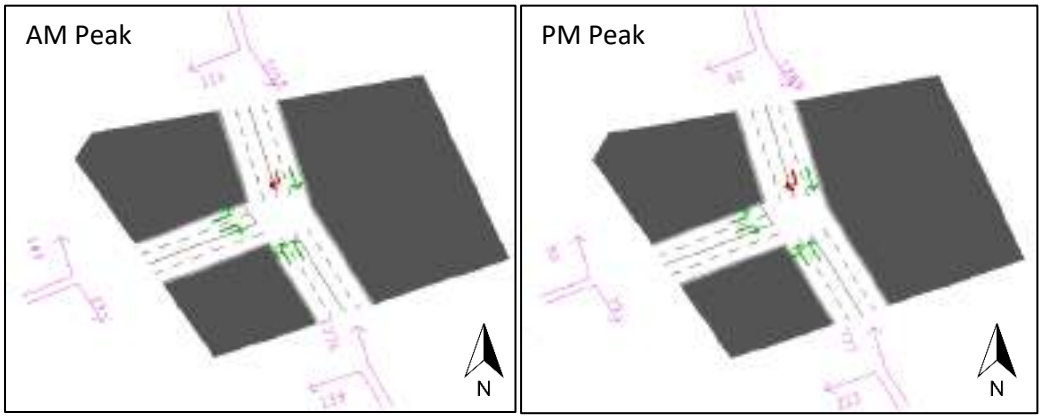
(oo) Intersection 41: Dr Belcher & Anna Magerman Crescent

The north approach will be operating at LOS E during both the AM peak hour and at LOS F during the PM peak hour. The east approach will be operating at LOS E during the AM peak hour. Turning flows are shown in the Figure below:



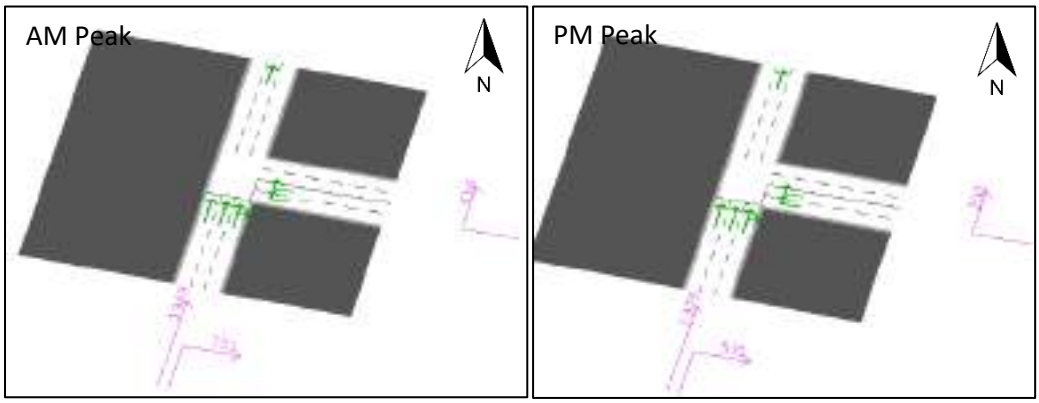
(pp) Intersection 42: Dr Belcher & Monapi Street

All approaches will be operating at acceptable LOS during both AM and PM peak hours. Turning flows are shown in the Figure below:



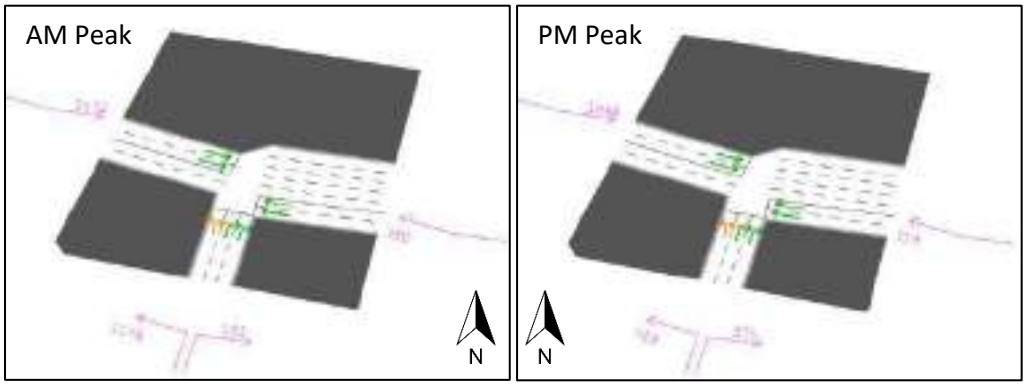
(qq) Intersection 43: OR Tambo North & Falck Street

All approaches will be operating at acceptable LOS during both AM and PM peak hours. Turning flows are shown in the Figure below:



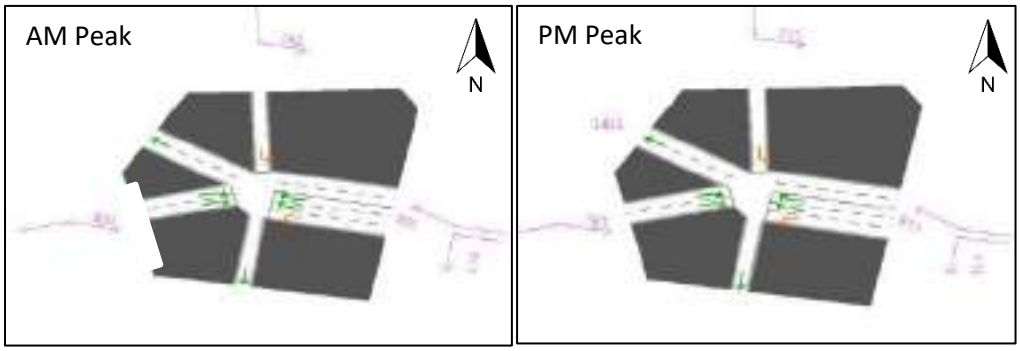
(rr) Intersection 44: OR Tambo North & Rhodes Avenue

All approaches will be operating at acceptable LOS during both AM and PM peak hours. Turning flows are shown in the Figure below:



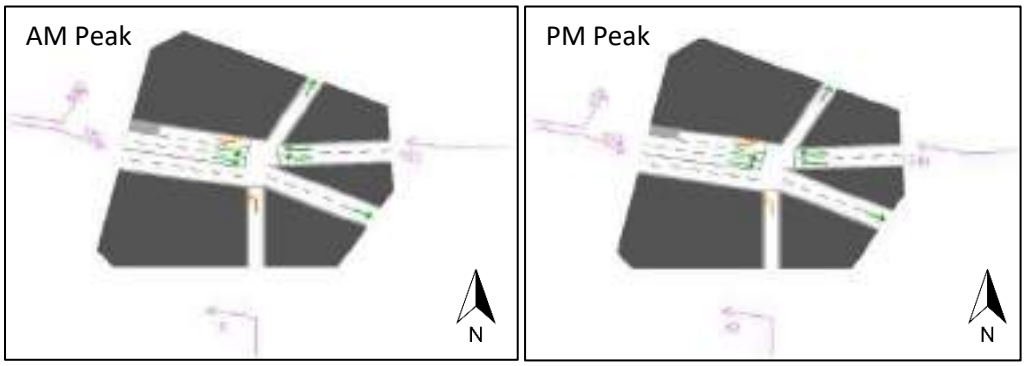
(ss) Intersection 45: OR Tambo & M10 Interchange (Eastern Terminal)

All approaches will be operating at acceptable LOS during both AM and PM peak hours. Turning flows are shown in the Figure below:



(tt) Intersection 46: OR Tambo & M10 Interchange (Western Terminal)

All approaches will be operating at acceptable LOS during both AM and PM peak hours. Turning flows are shown in the Figure below:

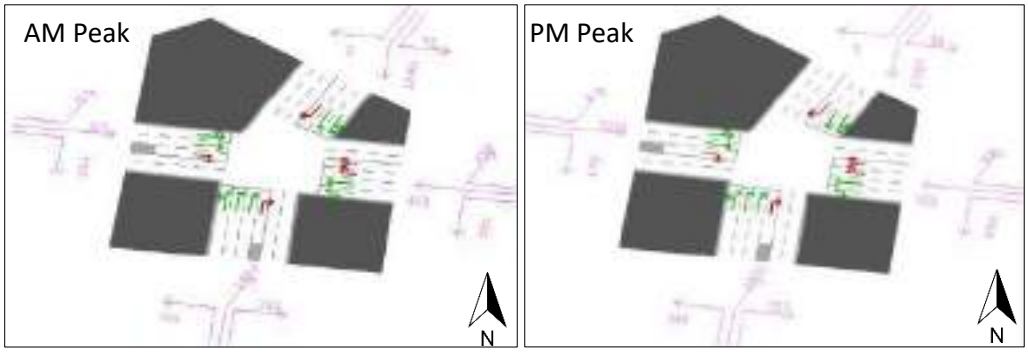


5.3 Horizon 2032 + Latent Rights

Similarly, this scenario analysis was undertaken in order to determine the traffic impact of all approved, but not yet built development's (Latent Rights), within the study area plus the Vista Park 1, 2 and Hillside View development's traffic. Again the analysis is used to identify what infrastructure is require excluding the effect of the Klipfontein generated traffic trips. Detailed capacity analysis results and link flows in vehicles per hour, for the Horizon 2032 + Latent Rights, are shown in Appendix F.

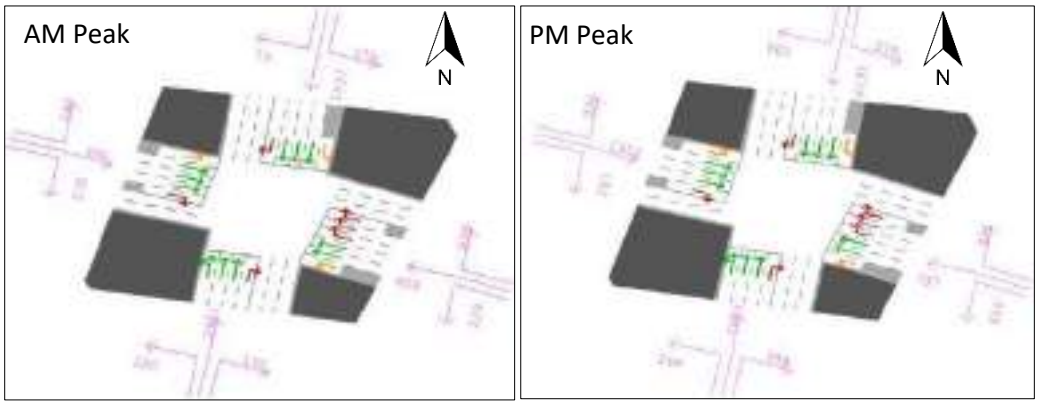
(a) Intersection 1: President Boshof Street & St Georges Street

The south and west approaches will both be operating at a poor LOS F in the AM peak hour and PM peak hour. The north approach will operate at poor LOS F in the PM peak hour. No further geometric upgrades are proposed due to space constraints. Turning flows are shown in the figure below:



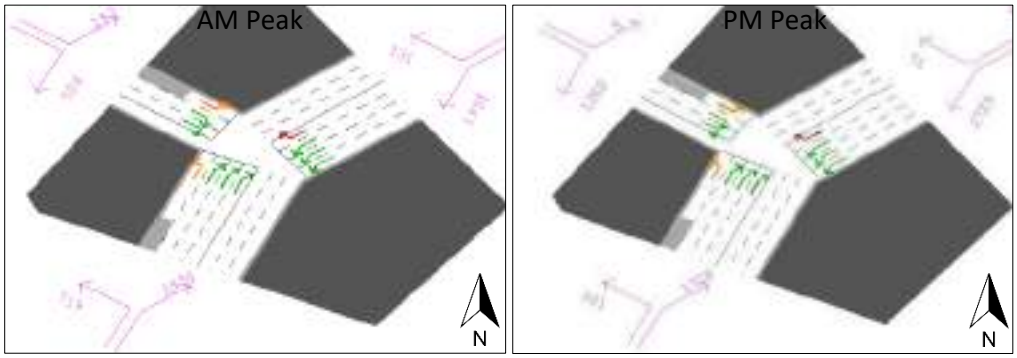
(b) Intersection 2: Kolbe Avenue & President Avenue

The west approach will be operating at a poor LOS E during the AM peak hour and PM peak hour. This intersection cannot be upgraded any further due to space constraints. Turning flows are shown in the Figure below:



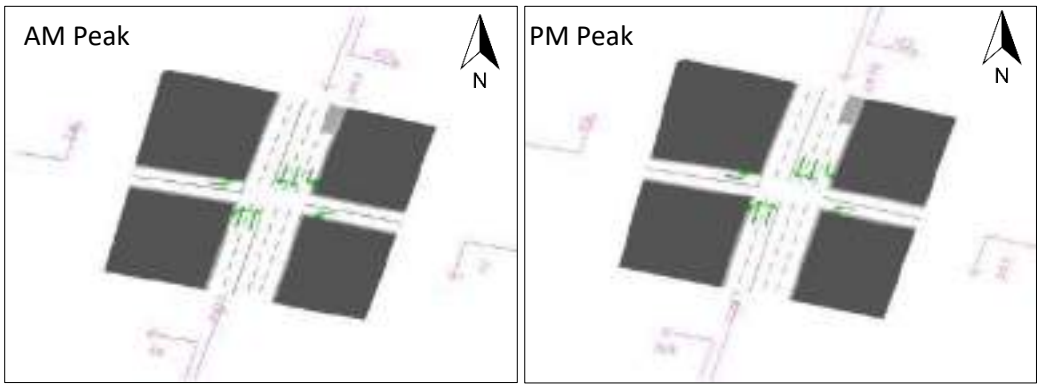
(c) Intersection 3: Kolbe Avenue & Roth Avenue

The west approach will be operating at a poor LOS F in the PM peak hour. Signal optimisation will improve the west approach operational performance. Turning flows are shown in the Figure below:



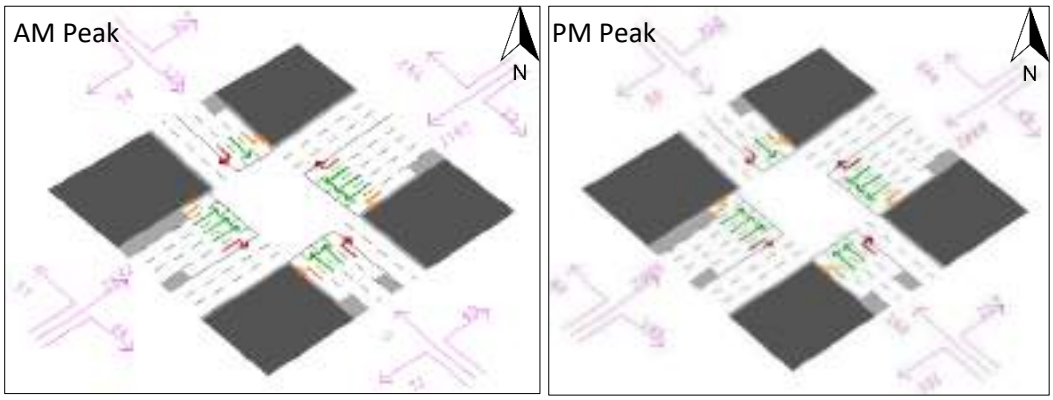
(d) Intersection 4: Curie Avenue & Nico Van Der Merwe

All approaches will be operating at acceptable LOS in the AM and PM peak hour. Turning flows are shown in the Figure below:



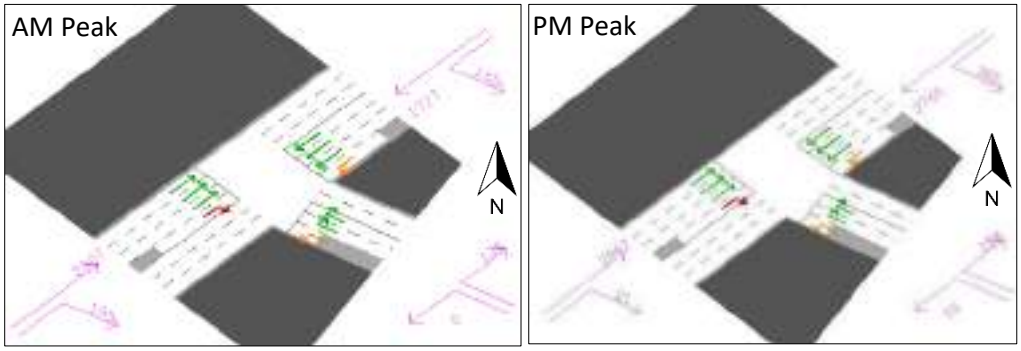
(e) Intersection 5: Curie Avenue & Pasteur Avenue

The south approach will be operating at a poor LOS F in the AM peak hour. The north approach will be operating at a poor LOS E in the AM peak hour. The East approach will be operating at a poor LOS E in the PM peak hour. Additional through lane is proposed on the south approach. Turning flows are shown in the Figure below:



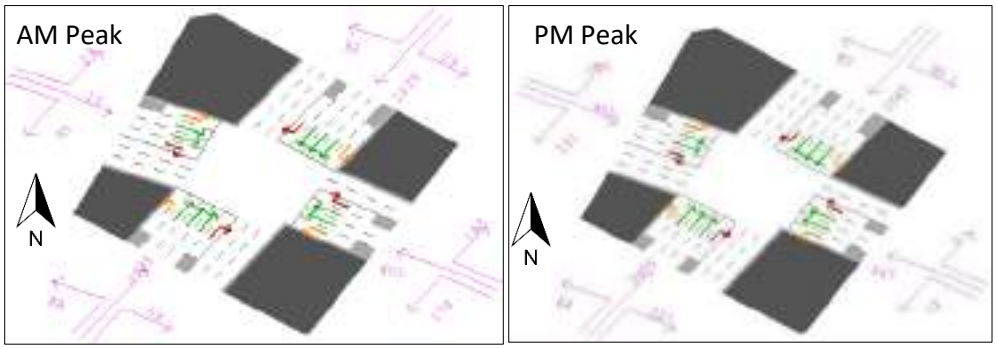
(f) Intersection 6: Curie Avenue & Sannaspos Road

The south approach will be operating at a poor LOS F in the AM peak hour. A third additional through lane is proposed on the south approach. Turning flows are shown in the Figure below:



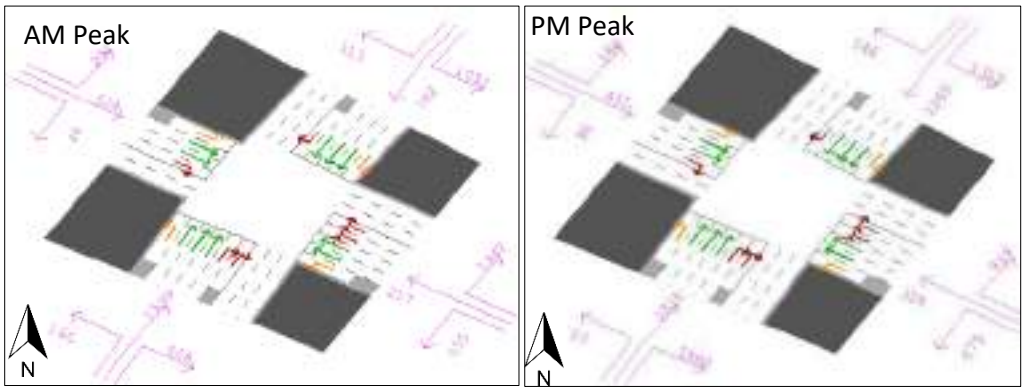
(g) Intersection 7: Curie Avenue & Generaal De La Rey

The north approach will be operating at a poor LOS E in the PM peak hour. Signal optimisation will improve the north approach operational performance. Turning flows are shown in the Figure below:



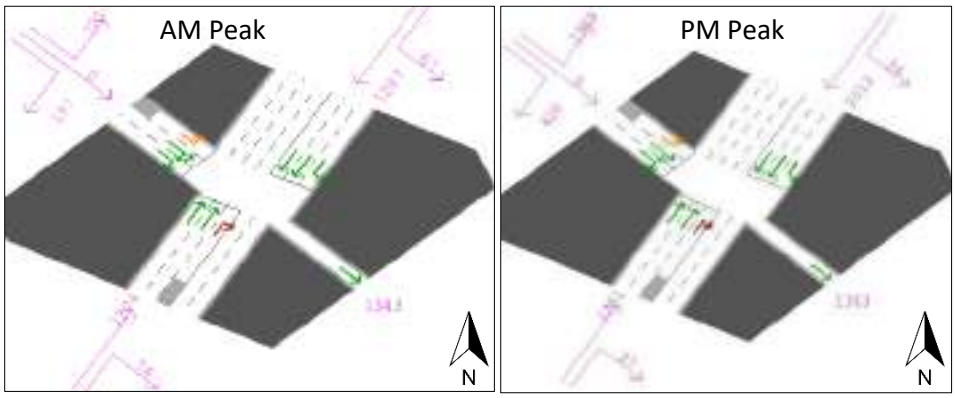
(h) Intersection 8: Curie Avenue & Vereeniging Drive

The south approach will be operating at a poor LOS F in the AM peak hour and PM peak hour. The north approach will be operating at a poor LOS F in the PM peak hour. The east approach will be operating at a poor LOS F in the AM and PM peak hour. A third additional right turn lane is proposed on the east approach to accommodate the high expected demand. Signal optimisation will also improve the north and south approach operational performance. Flows are shown in the Figure below:



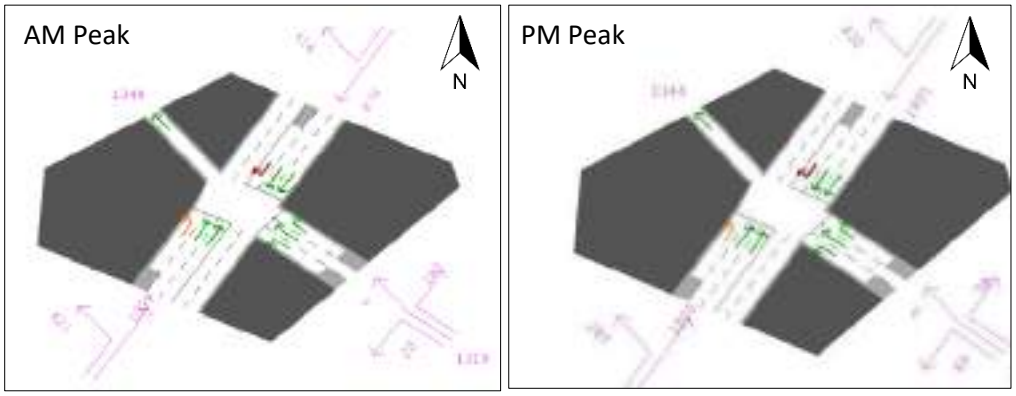
(i) Intersection 9: N1 & Curie Avenue Off Ramp (Northern Quadrant)

The west approach will be operating at a poor LOS F in the PM peak hour. A second additional tight turn lane is proposed on the west approach. Turning flows are shown in the Figure below:



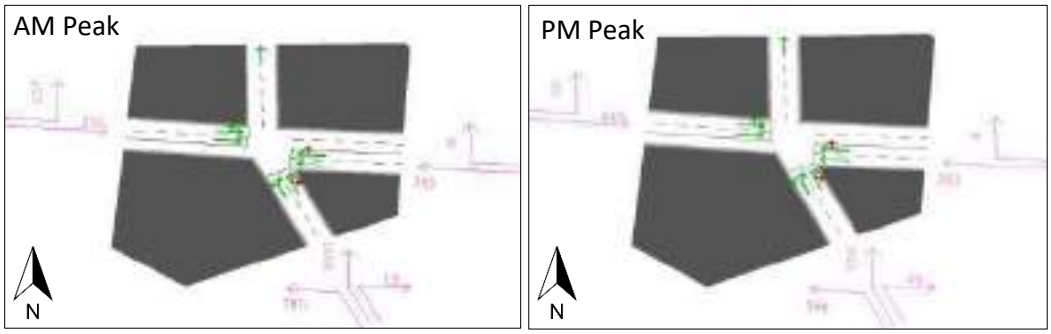
(j) Intersection 10: N1 & Curie Avenue Off Ramp (Southern Quadrant)

The east approach will be operating at a poor LOS F in the PM peak hour. An exclusive short left turn lane is proposed on the east approach. Turning flows are shown in the Figure below:



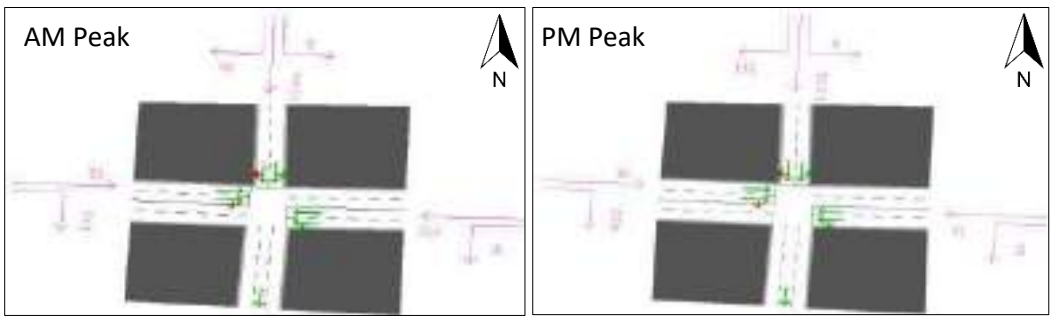
(k) Intersection 11: St Georges & Hanger Street

The south approach will be operating at a poor LOS E in the AM peak hour and LOS F in the PM peak hour. No further upgrades are possible at this intersection due to space constraints. Turning flows are shown in the Figure below:



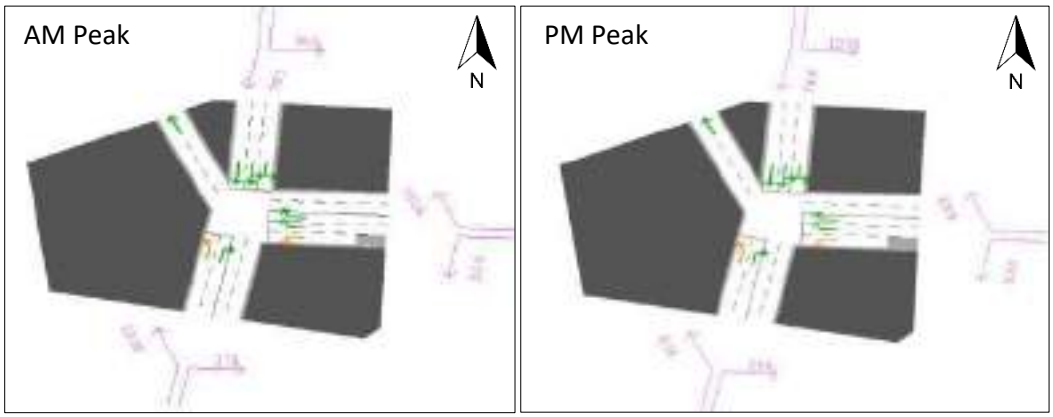
(l) Intersection 12: St Georges & Harvey Road

All approaches will be operating at an acceptable LOS in the AM and PM peak hours. Turning flows are shown in the Figure below:



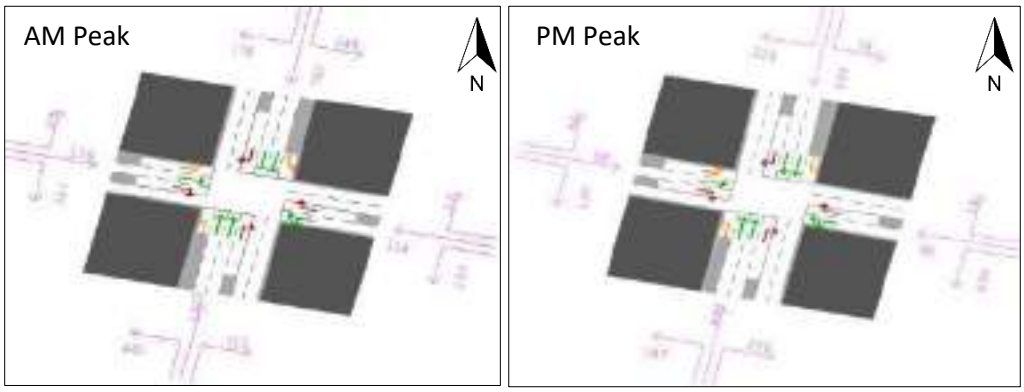
(m) Intersection 13: Harvey Road & Hanger & Fort Street

The south approach at a poor LOS E in the AM peak hour. The north approach will be operating at a poor LOS E in the AM and at a poor LOS F in the PM peak hour. No further upgrades are possible at this intersection due to space constraints. Turning flows are shown in the Figure below:



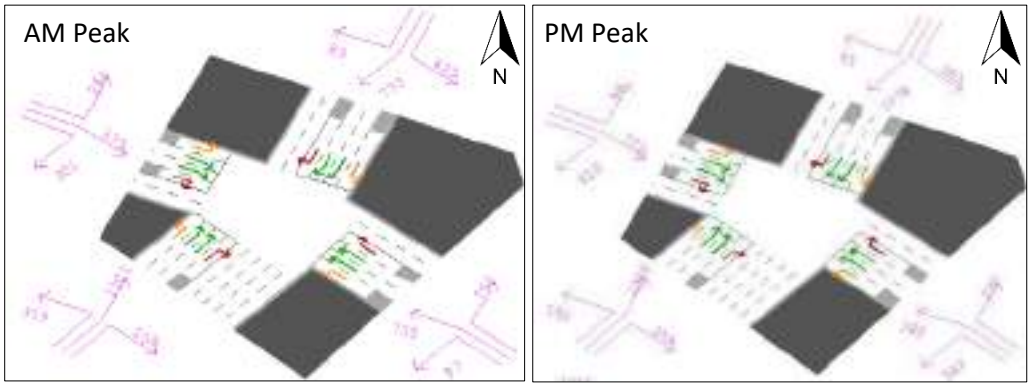
(n) Intersection 14: Harvey Road & Rhodes Avenue

The west approach will be operating at a poor LOS F in the AM and PM peak hours. The east approach will be operating at a poor LOS F in the PM peak hour. No further upgrades are possible at this intersection due to space constraints. Turning flows are shown in the Figure below:



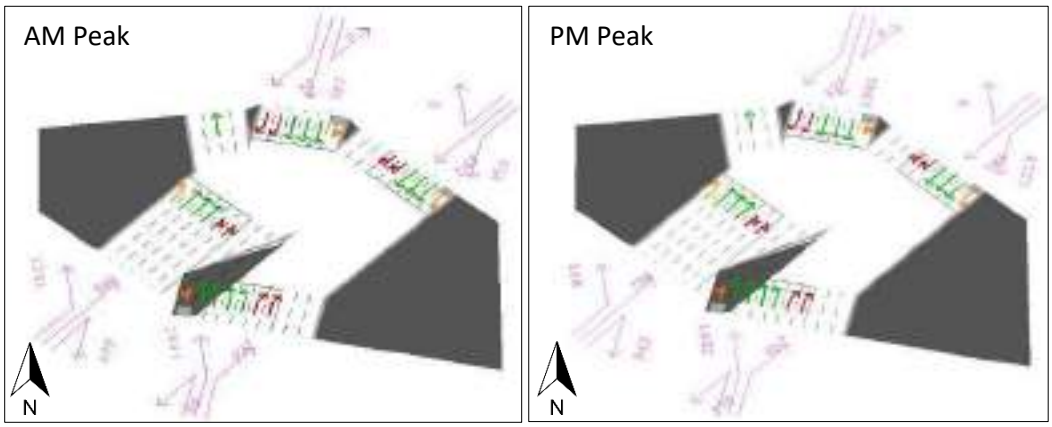
(o) Intersection 15: Harvey Road & Fort Hare Road

The east approach will be operating at a poor LOS E in the AM peak hour. No further upgrades are possible at this intersection due to space constraints. Turning flows are shown in the Figure below:



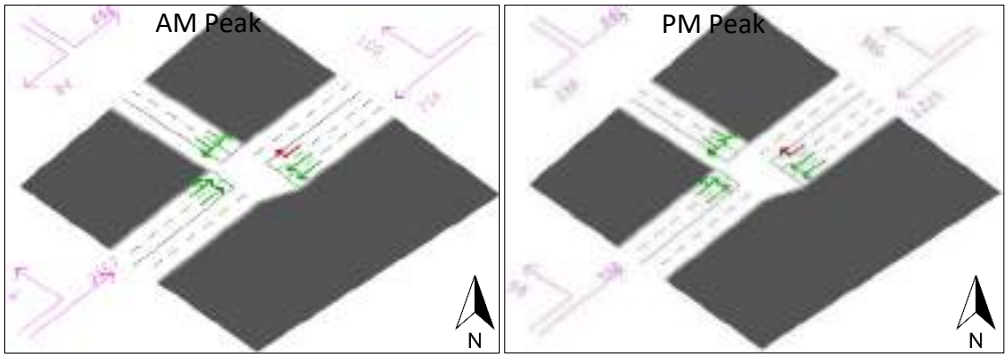
(p) Intersection 16: Harvey Road & OR Tambo

The west approach will be operating at poor LOS F in the AM peak hour and at poor LOS F in the PM peak hour. The north approach will be operating at a poor LOS F in the PM peak hour. The east approach will be operating at a poor LOS E in the PM peak hour. This intersection has been upgraded to the maximum and therefore no further upgrades are proposed. Turning flows are shown in the Figure below:



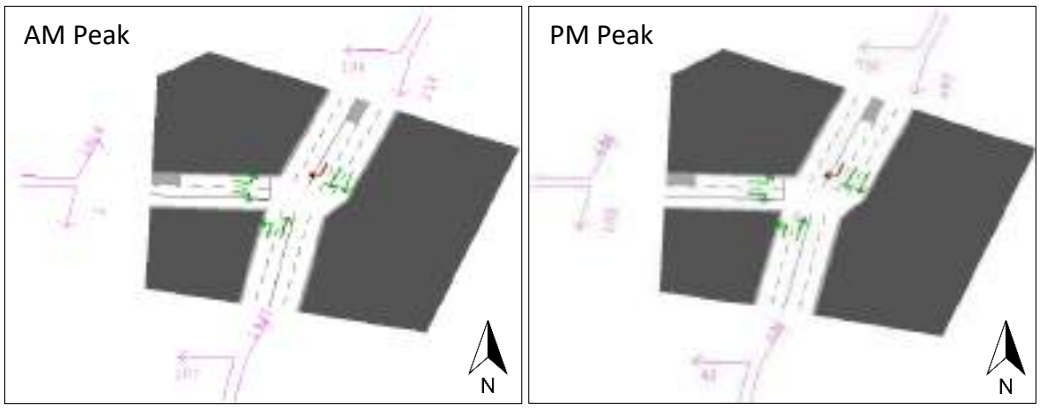
(q) Intersection 17: Monument & Hornby Street

All approaches will be operating at acceptable LOS during the AM and PM peak hours. Turning flows are shown in the Figure below:



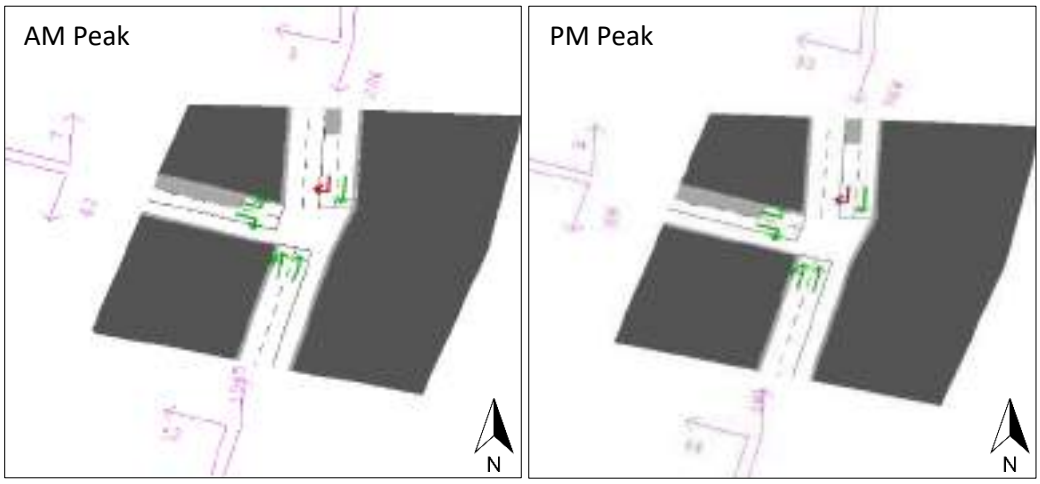
(r) Intersection 18: Memoriam Road & De La Rey Avenue

All approaches will be operating at acceptable LOS during the AM and PM peak hours. Turning flows are shown in the Figure below:



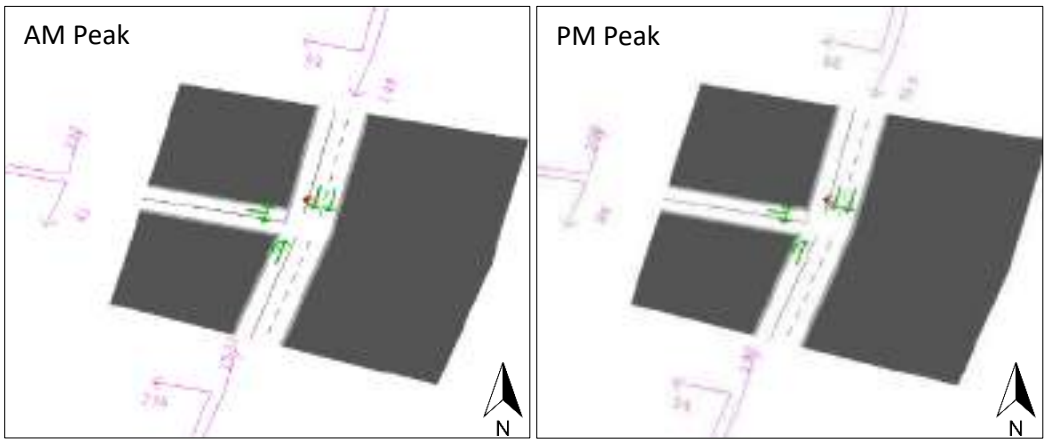
(s) Intersection 19: Ferreira Road & Helpmekaar Street

All approaches will be operating at acceptable LOS during the AM and PM peak hours. Turning flows are shown in the Figure below:



(t) Intersection 20: Ferreira Road & Burger Crescent

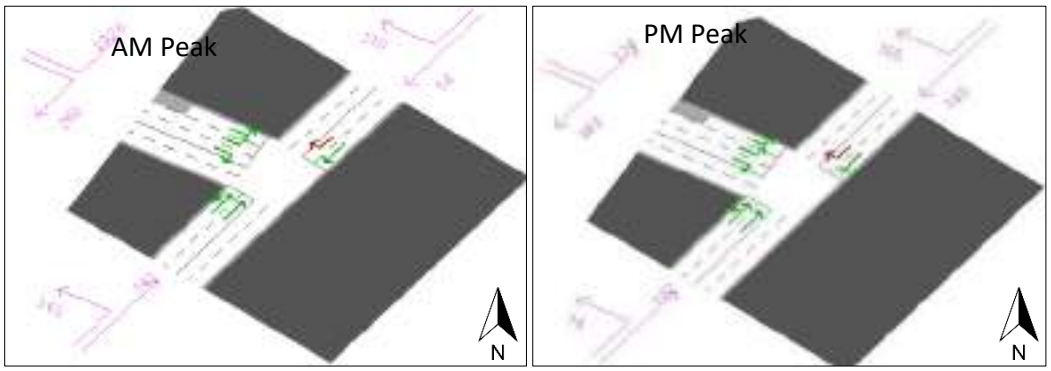
The west approach will be operating at a poor LOS F in the AM peak hour. The north approach will be operating at a poor LOS F in the AM peak hour. Intersection 20 is located next to intersection 19: Ferreira Road & Helpmekaar Street, 700 m away. It will be operating with extra capacity, queues can divert from intersection 20 to 19. Therefore no upgrades are proposed for this intersection. Turning flows are shown in the Figure below:



(u) Intersection 21: Ferreira Road & Generaal Brand Drive

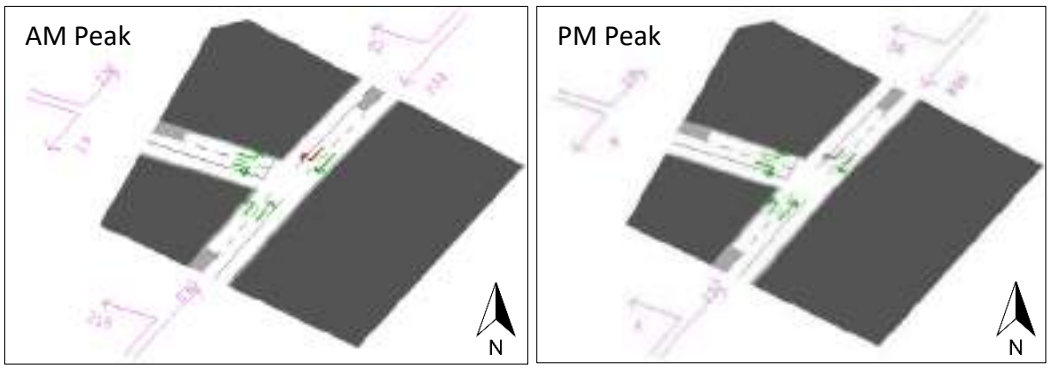
Initially all approaches will be operating at acceptable LOS in the AM and PM peak hours however because of the induced traffic which is a result of vehicles deciding to travel along routes with spare capacity. To mitigate induced demand, an additional through lane on the south and an exit lane on the north approach is proposed, including converting the centre lane from a left to right turning lane.

Turning flows are shown in the Figure below:



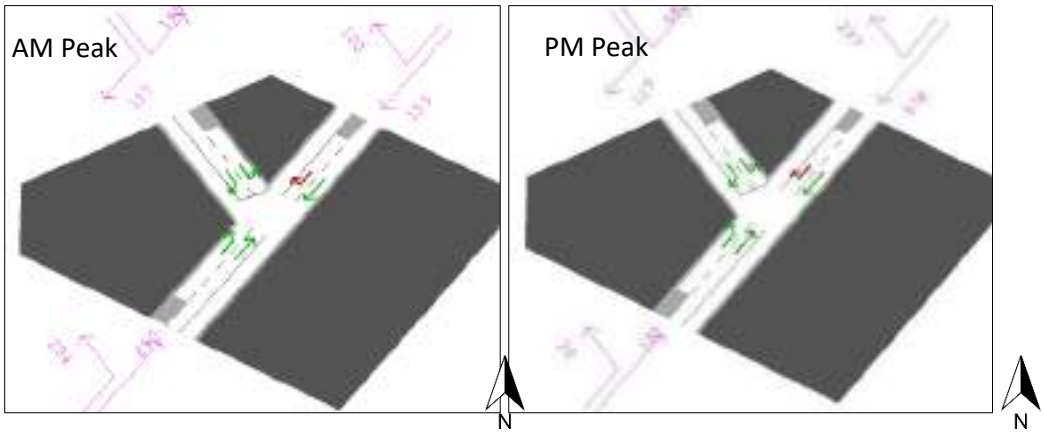
(v) Intersection 22: Ferreira Road & Vereeniging Drive (North Terminal)

All approaches will be operating at acceptable LOS in the AM and PM peak hours.



(w) Intersection 23: Ferreira Road & Vereeniging Drive (North Terminal)

All approaches will be operating at acceptable LOS in the AM and PM peak hours.

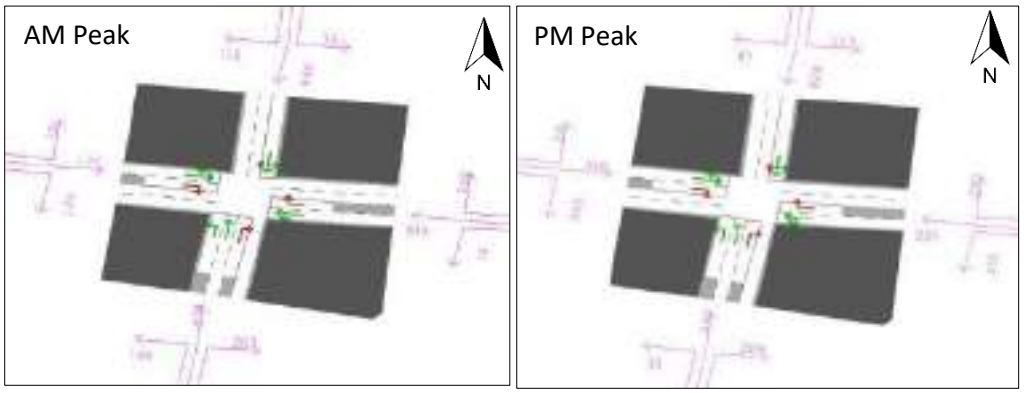


(x) Intersection 24: Road to Ehrlich Park & M10

N/A

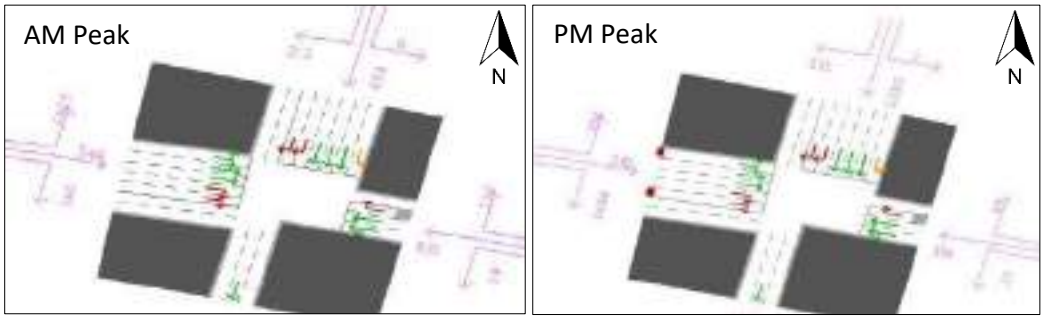
(y) Intersection 25: OR Tambo & St Georges Street

The south approach will be operating at a poor LOS F in the AM peak hour and PM peak hour. The west approach will be operating at a poor LOS F in the AM peak hour and PM peak hour. The north approach will be operating at a poor LOS E in the AM peak hour poor and LOS F in the PM peak hour. The east approach will be operating at poor LOS F in the AM peak hours. No further upgrades are possible at this intersection due to space constraints. Turning flows are shown in the Figure below:



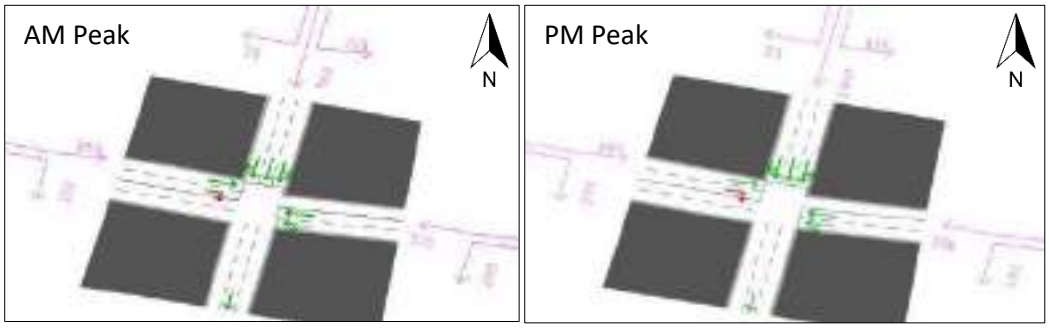
(z) Intersection 26: OR Tambo & Rhodes Avenue

The west approach will be operating at a poor LOS E in the AM peak hour poor and LOS F in the PM peak hour. No further upgrades are possible at this intersection due to space constraints. Turning flows are shown in the Figure below:



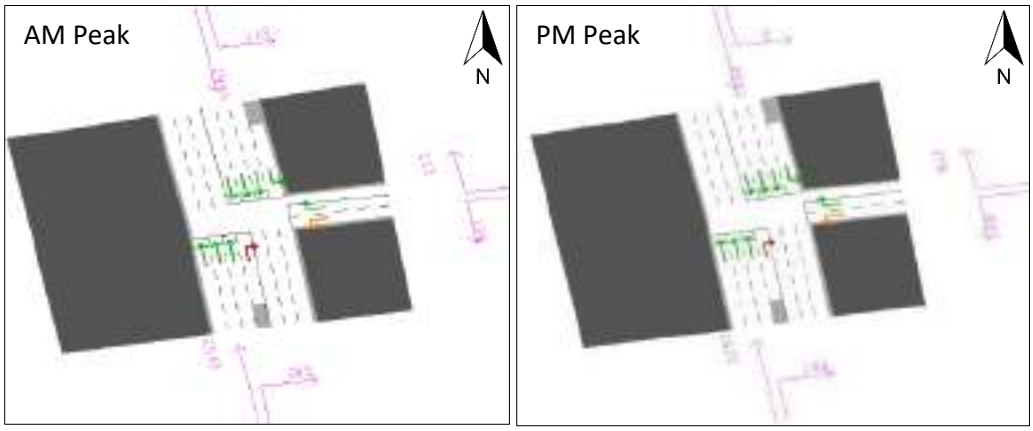
(aa) Intersection 27: OR Tambo & Falck Street

All approaches will be operating at acceptable LOS in the AM and PM peak hours. Turning flows are shown in the Figure below:



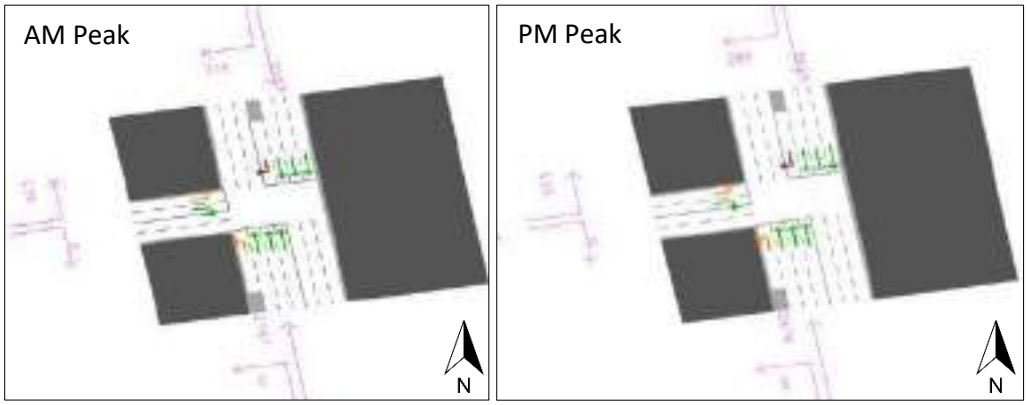
(bb) Intersection 28: OR Tambo & Vooruitsig Street

All approaches will be operating at acceptable LOS in the AM and PM peak hours. Turning flows are shown in the Figure below:



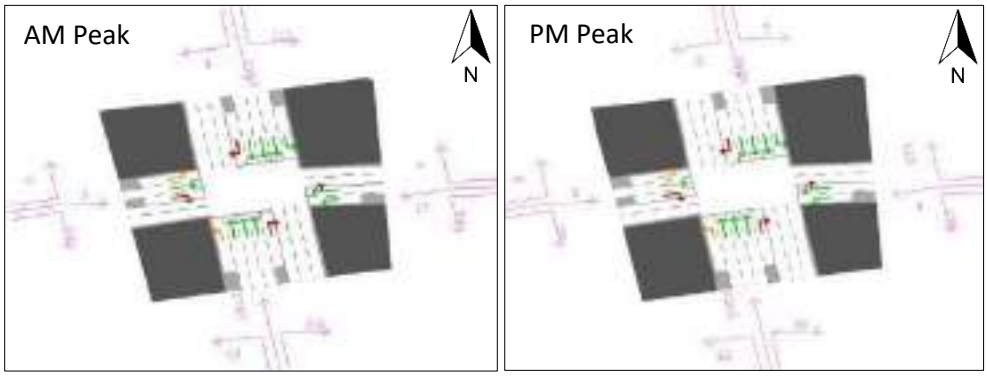
(cc) Intersection 29: OR Tambo & De Waal Road

The south approach will be operating at a poor LOS F in the AM peak hour. Turning flows are shown in the Figure below:



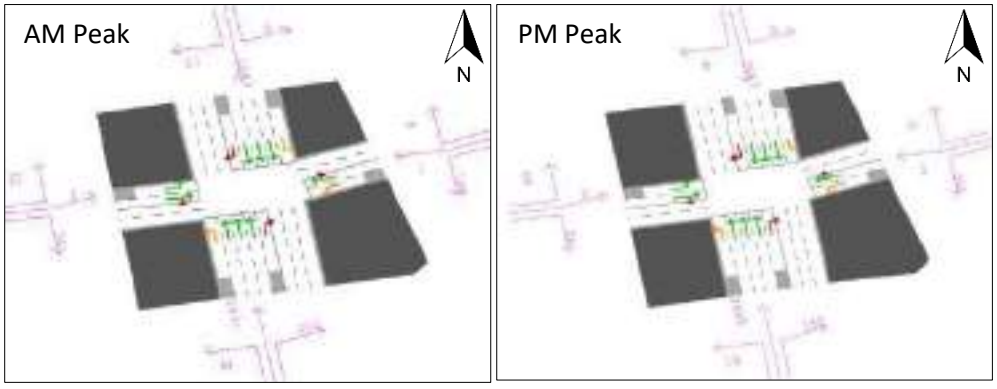
(dd) Intersection 30: OR Tambo & Gutsche Street

All approaches operate at acceptable LOS in the AM and PM peak hours. Turning flows are shown in the Figure below:



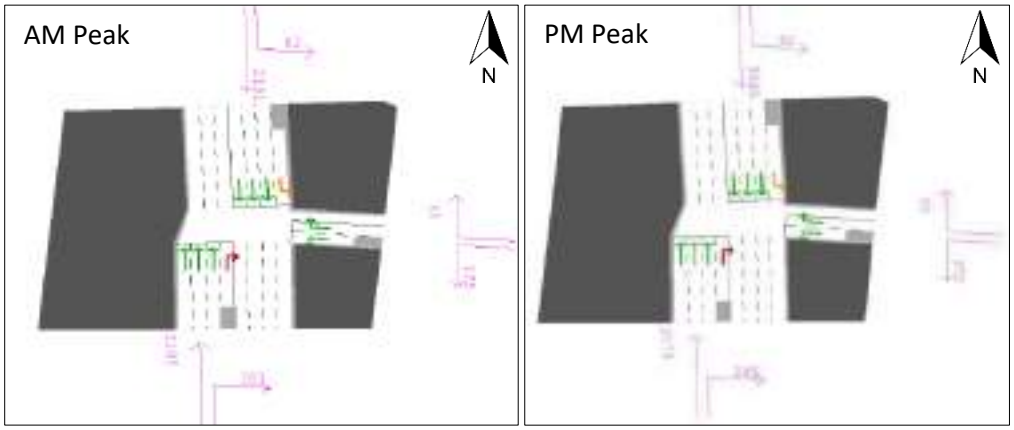
(ee) Intersection 31: OR Tambo & Hartley Street

The south approach will be operating at a poor LOS F in the PM peak hour. The north approach will be operating at a poor LOS F in the PM peak hour. A third additional through lane is proposed on the south approach. Turning flows are shown in the Figure below:



(ff) Intersection 32: OR Tambo & Tannery Street

The north approach will be operating at a poor LOS F in the PM peak hour. A third additional through lane is proposed on the south approach. Turning flows are shown in the Figure below:

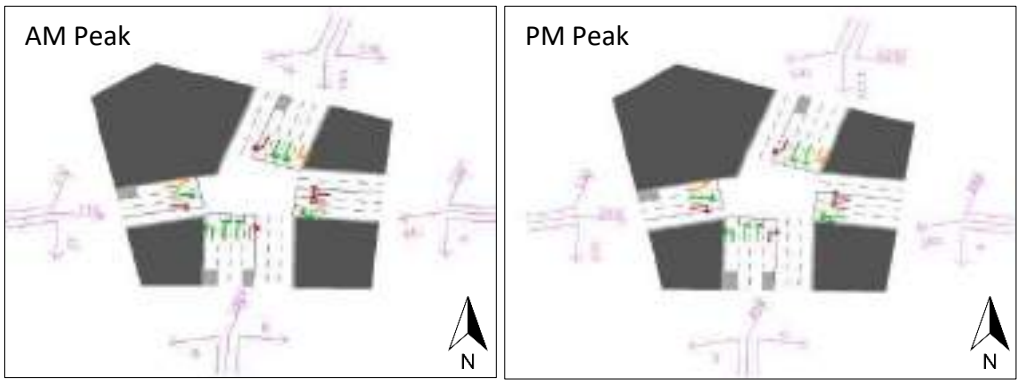


(gg) Intersection 33: OR Tambo & M10

The intersection will be converted to a switching interchange (intersection 45 and Intersection 46).

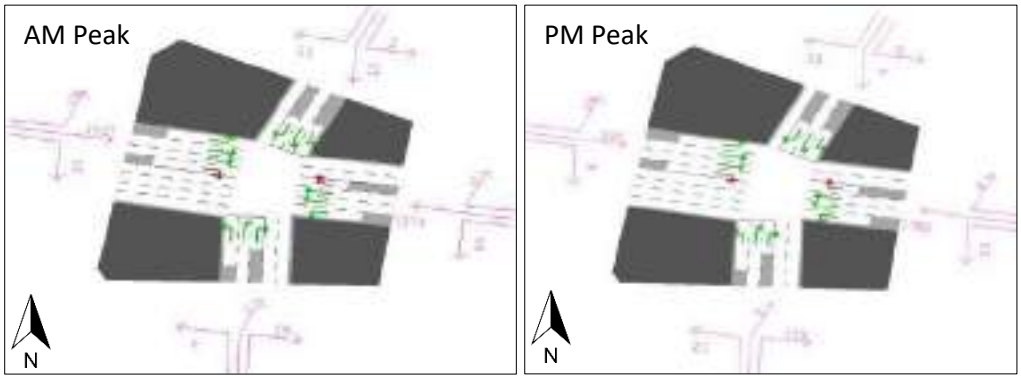
(hh) Intersection 34: OR Tambo & Link Road

All approaches will be operating at acceptable LOS in the AM and PM peak hours. Turning flows are shown in the Figure below:



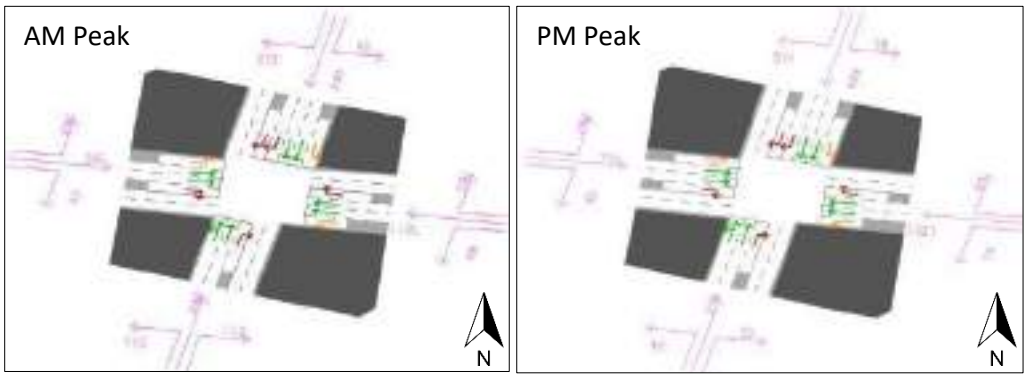
(ii) Intersection 35:M10 & Piet Human Street

The south approach will be operating at a poor LOS E in the AM peak hour and at poor LOS F in the PM peak hour. The north approach will be operating at a poor LOS F in the AM and PM peak hours. Turning flows are shown in the Figure below:



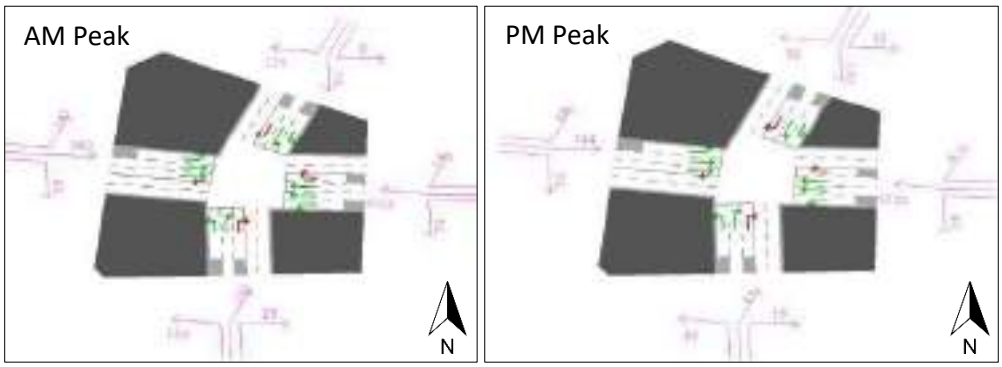
(jj) Intersection 36: M10 & Moshoeshoe Street

All approaches will be operating at acceptable LOS in the AM and PM peak hours. Turning flows are shown in the Figure below:



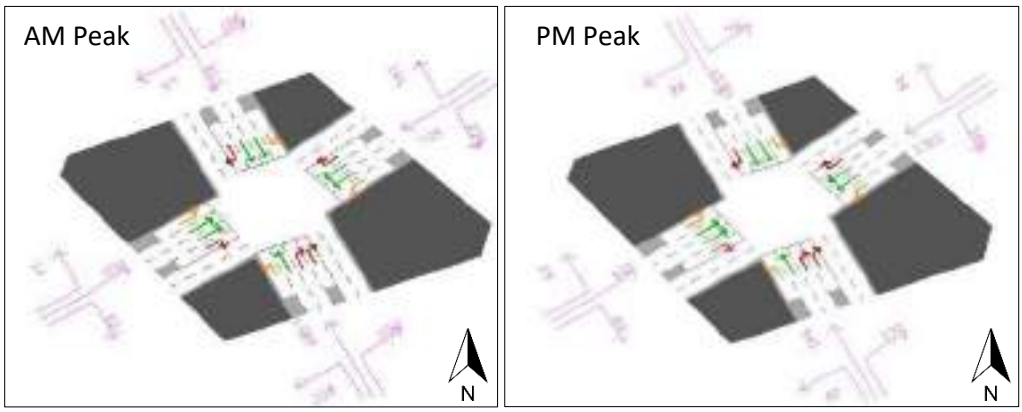
(kk) Intersection 37: M10 & Singonzo Street

The south approach will be operating at a poor LOS F in the AM peak hour. The north approach will be operating at a poor LOS E in the AM and PM peak hours. Signal optimisation will improve this intersection capacity operation. Turning flows are shown in the Figure below:



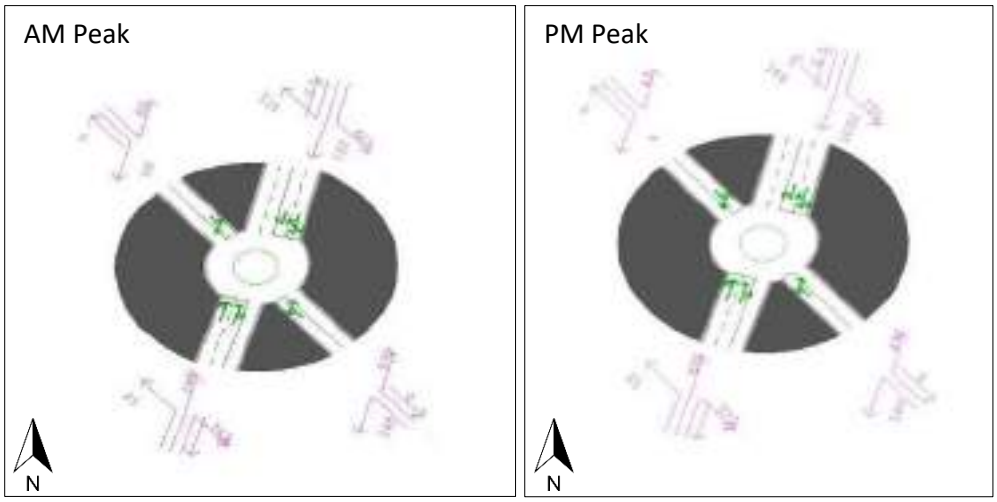
(ll) Intersection 38: M10 & Dr Belcher Road

The east approach will be operating at poor LOS F in the PM peak hour. Turning flows are shown in the Figure below:



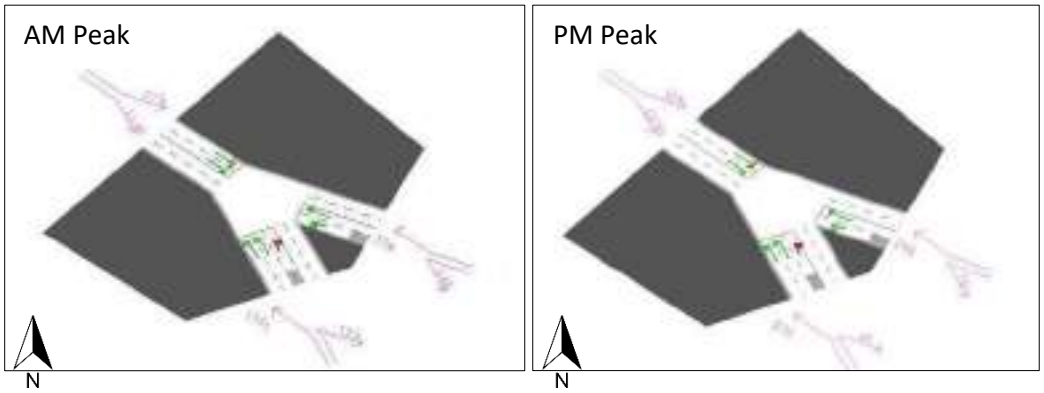
(mm) Intersection 39: Dr Belcher & Hamilton Road

All approaches will be operating at acceptable LOS in the AM and PM peak hours. Turning flows are shown in the Figure below:



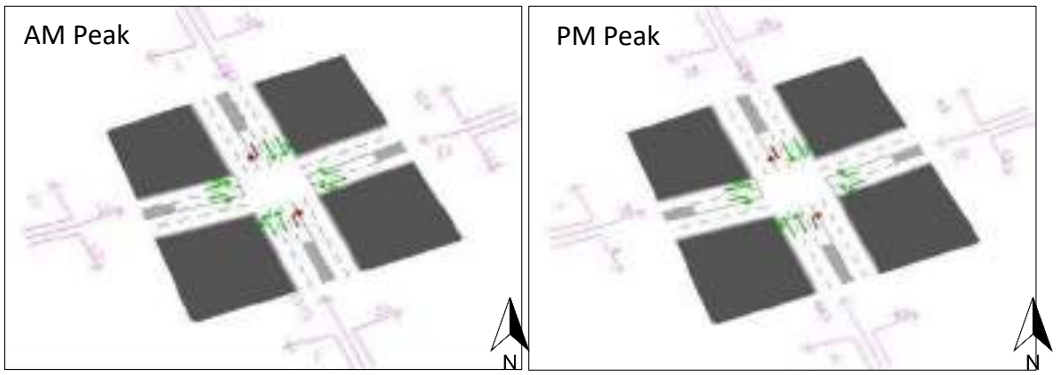
(nn) Intersection 40: Dr Belcher & Heatherdale Road

All approaches will be operating at acceptable LOS in the AM and PM peak hours. Turning flows are shown in the Figure below:



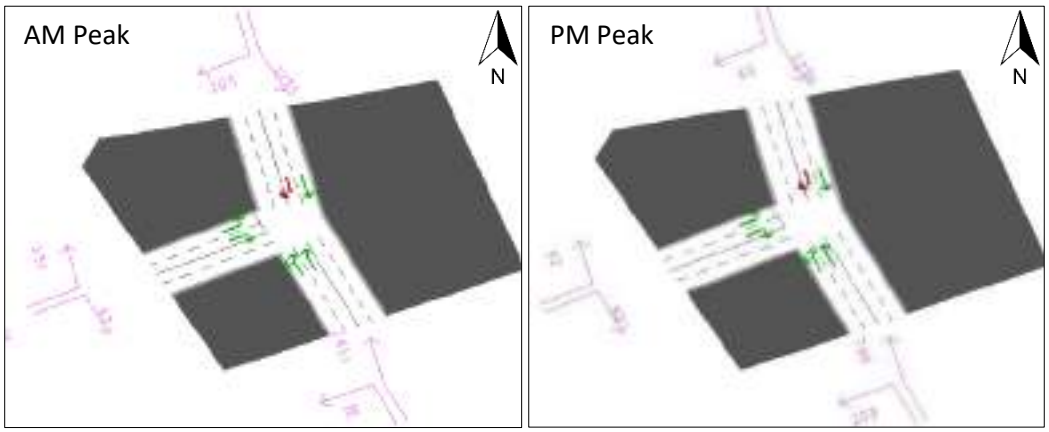
(oo) Intersection 41: Dr Belcher & Anna Magerman Crescent

The west approach will be operating at a poor LOS E in the AM peak hour. The north approach will be operating at a poor LOS E in the AM peak hour and PM peak hour. The east approach will be operating at a poor LOS F in the AM peak hour. Intersection 41 is located in the vicinity of other intersections with capacity that any queues can divert to. Therefore, no upgrades are proposed for this intersection. Turning flows are shown in the Figure below:



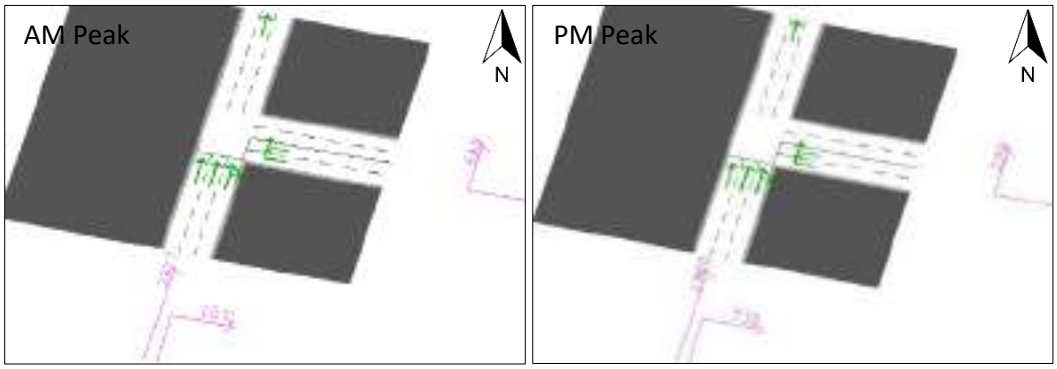
(pp) Intersection 42: Dr Belcher & Mohapi Street

The west approach will be operating at a poor LOS E in the AM peak hour. Turning flows are shown in the Figure below:



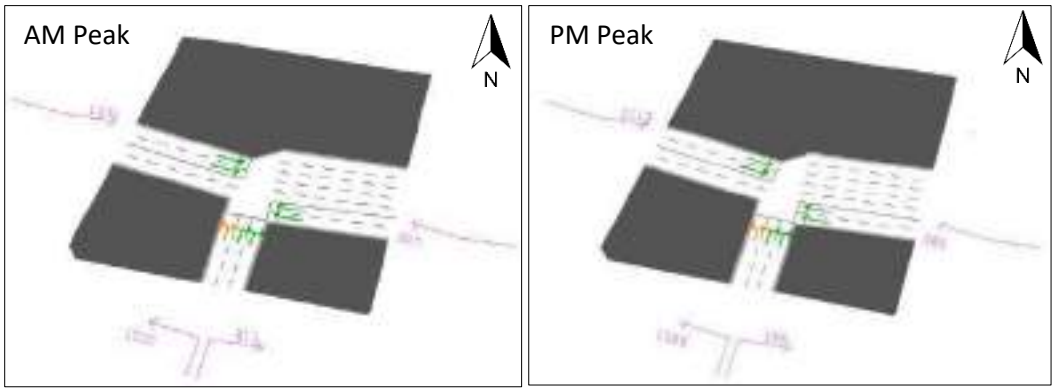
(qq) Intersection 43: OR Tambo North & Falck Street

All approaches will be operating at acceptable LOS in the AM and PM peak hours. Turning flows are shown in the Figure below:



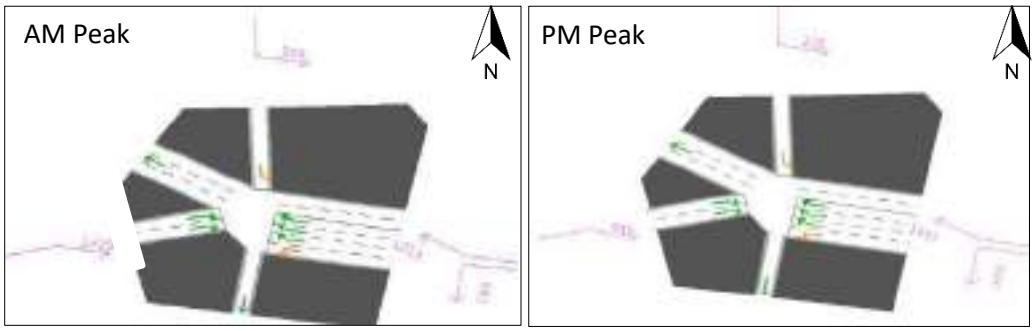
(rr) Intersection 44: OR Tambo North & Rhodes Avenue

The south approach will be operating at a poor LOS F in the AM peak hours. Signal optimisation will improve the south approach operational performance. Turning flows are shown in the Figure below:



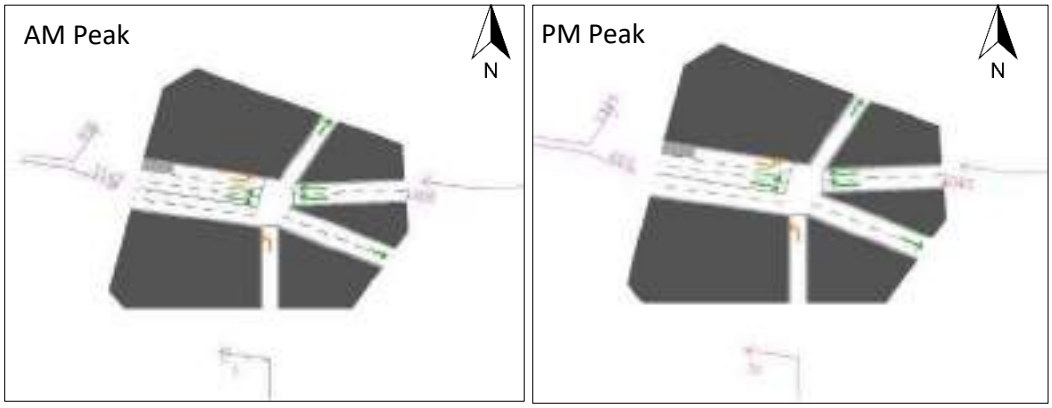
(ss) Intersection 45: OR Tambo & M10 Interchange (Eastern Terminal)

All approaches will be operating at acceptable LOS in the AM and PM peak hours. Turning flows are shown in the Figure below:


AM Peak
N
PM Peak
N

(tt) Intersection 46: OR Tambo & M10 Interchange (Western Terminal)

All approaches will be operating at acceptable LOS in the AM and PM peak hours. Turning flows are shown in the Figure below:



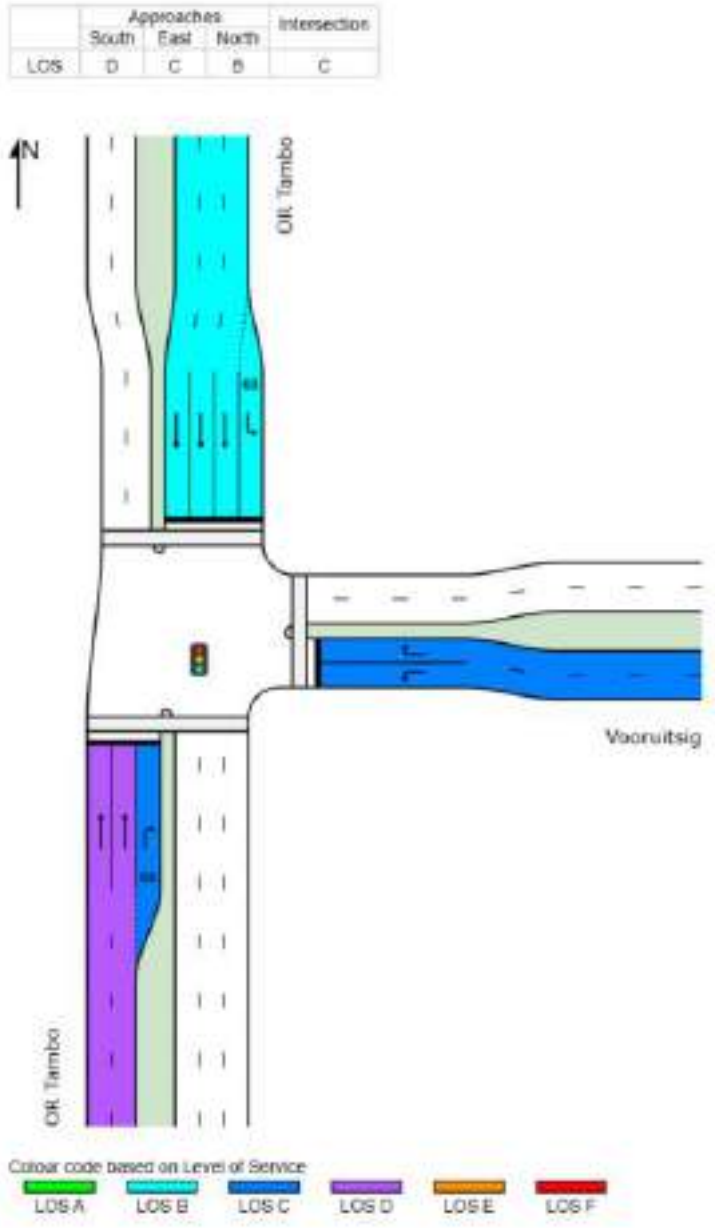
5.4 2022 Year + Latent Rights + Klipfontein Development

Due to issues with the software package SATURN during the Stages of lockdown, the analysis was conducted using SIDRA for the AM peak. The latent demand volumes were extracted from the previously approved Mangaung SATURN 2022 scenario model. The trips generated by the Klipfontein development were distributed in accordance to the attraction zones and assessed as individual intersections in conjunction with the proposed latent demand distribution scenarios. The intersections assessed were those identified in chapter 3.

The movement summaries of the assessed intersections are shown in annexure E. The LOS and required infrastructure results identified affected intersections as identified in chapter 3 are shown below for the 2022 growth scenario.

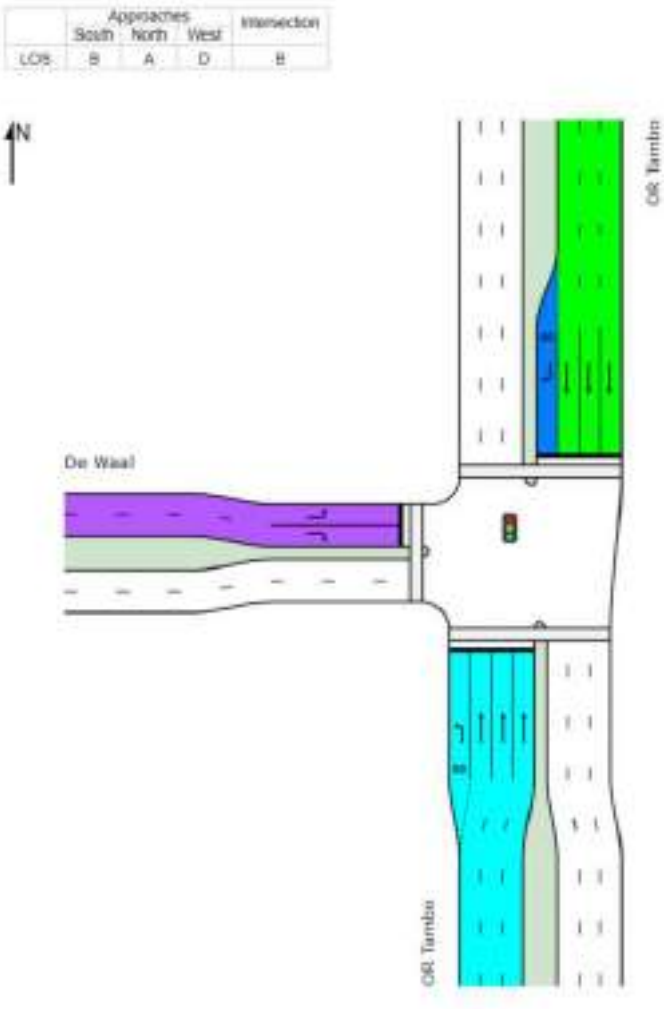
(a) Intersection 28: OR Tambo & Vooruitsig Street

It was required that a third additional through southbound lane is proposed to improve capacity operations at this intersection. The proposed 2022 improvements are recommended for the latent demand still satisfy the intersection with the proposed Klipfontein development trip added. Refer to the Figure below:



(b) Intersection 29: OR Tambo & De Waal Road

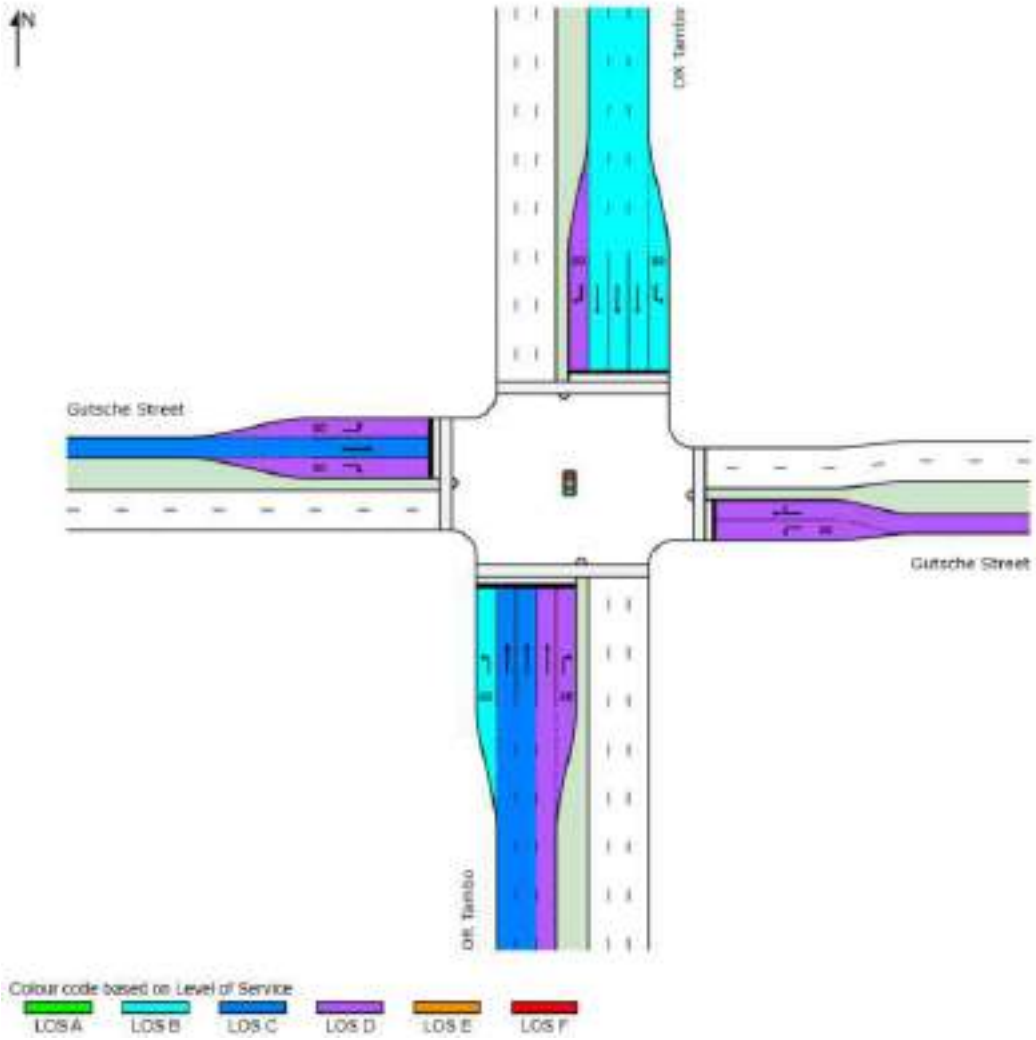
The proposed traffic signal coupled with a third additional through southbound and North bound lane is proposed at this intersection to accommodate the latent demand and Klipfontein trips. Refer to the Figure below:



(c) Intersection 30: OR Tambo & Gutsche Street

To accommodate the Latent demand traffic, a traffic signal coupled with a third additional through southbound lane is proposed at this intersection. To satisfy the Klipfontein AM peak developments trips, an additional north bound through lane is required. This satisfies the demand increased by the Klipfontein development. Refer to the Figure below:

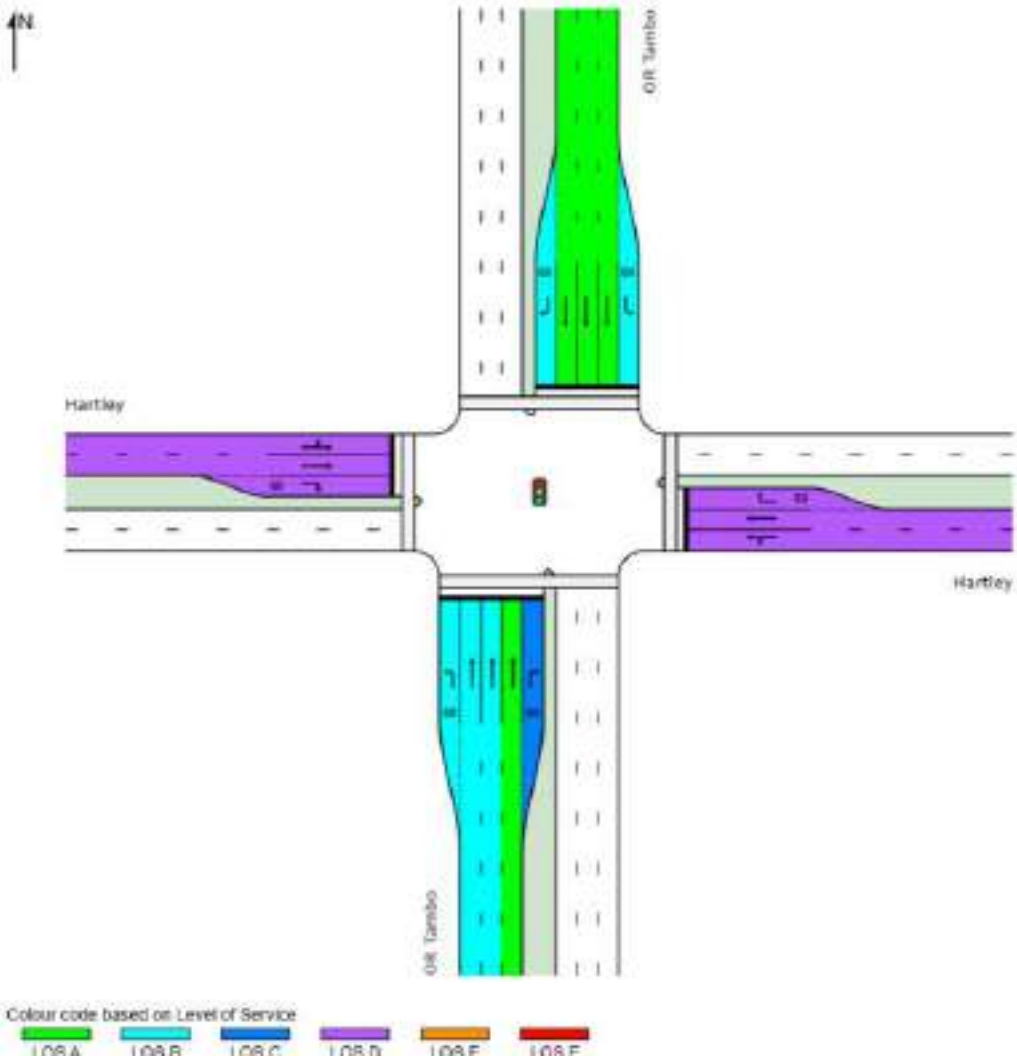
	Approaches				Intersection
	South	East	North	West	
LOS	D	D	B	D	C



(d) Intersection 31: OR Tambo & Hartley Street

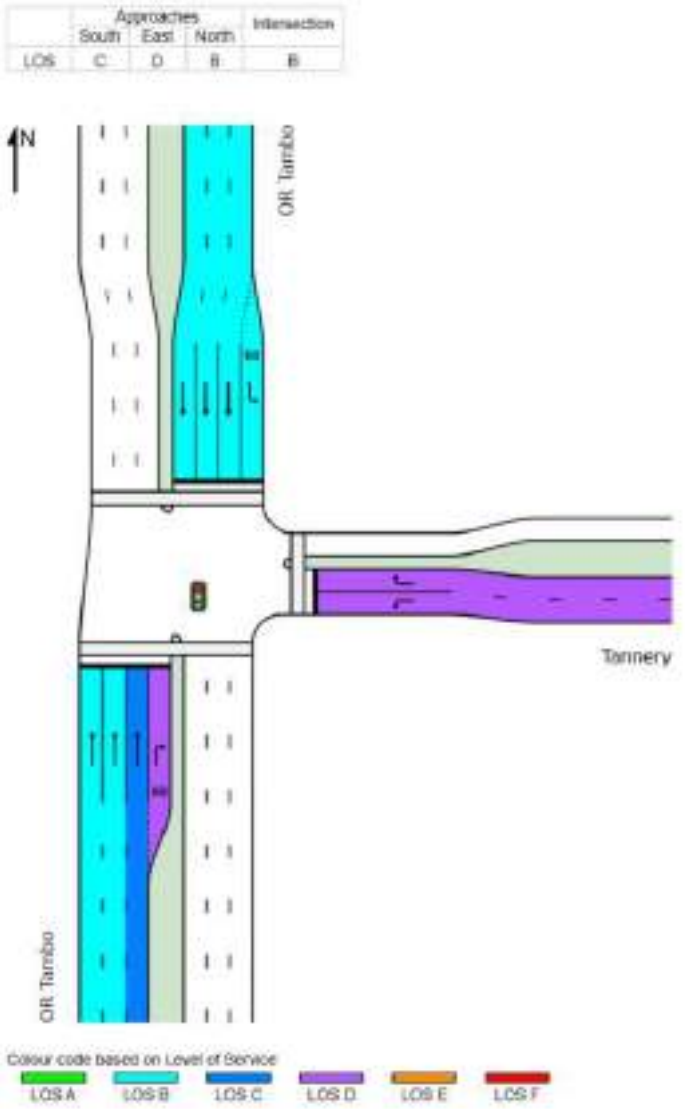
Again a traffic signal coupled with a third additional through southbound lane is proposed at this intersection. In addition, a third additional through northbound lane is required. This is then sufficient for the Klipfontein development. Refer to the Figure below:

	Approaches				Intersection
	South	East	North	West	
LOS	B	D	A	D	B



(e) Intersection 32: OR Tambo & Tannery Street

Again the proposed traffic signal coupled with third additional through southbound and northbound lanes is proposed at this intersection are sufficient to accommodate the additional traffic. This is as per the requirements needed to satisfy the latent demand previously assessed. Refer to the Figure below:



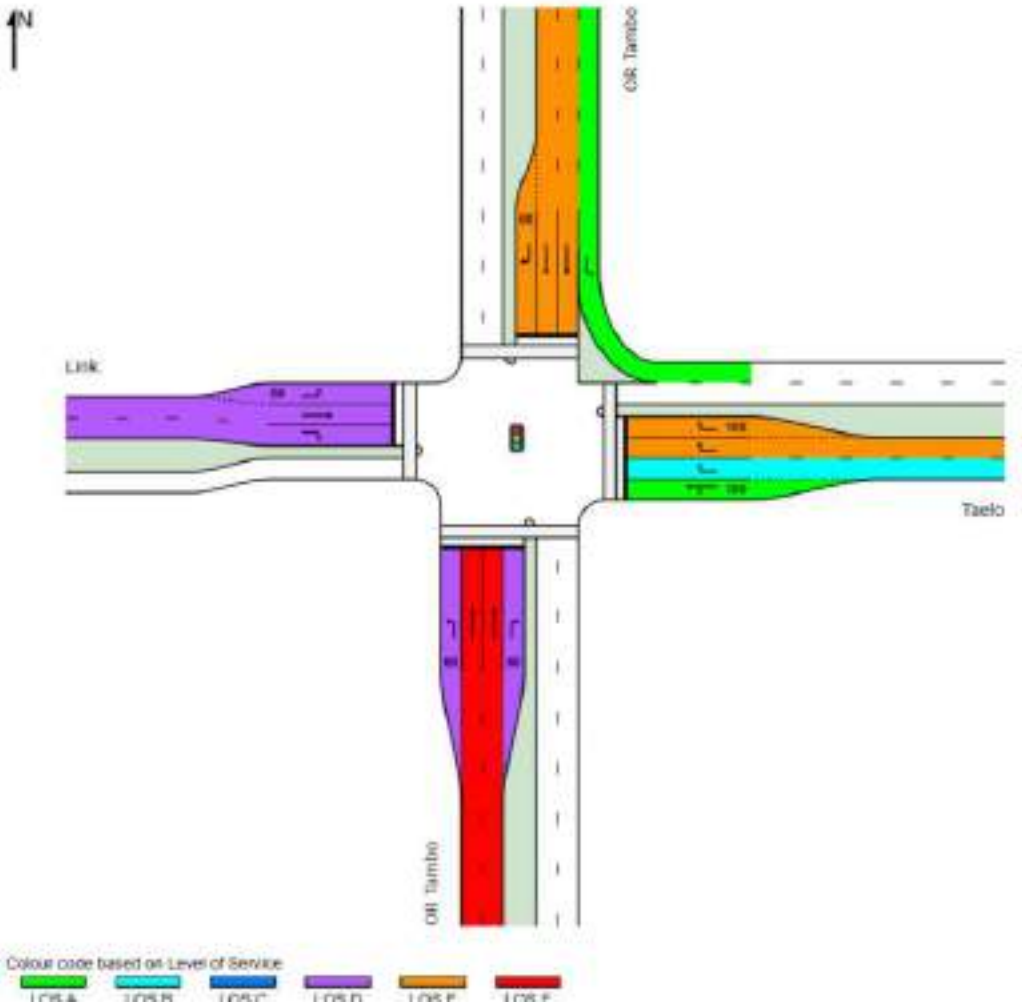
(f) Intersection 33: OR Tambo & M10

This intersection will be converted to a Diverging Diamond interchange (Intersection 45 and Intersection 46). The proposed layout is shown in Appendix K. The interchange has sufficient capacity to accommodate the proposed developments trips.

(g) Intersection 34: OR Tambo & Link Road & Hillside View Access 1

To accommodate the Klipfontein AM peak trips, an additional third right turn lane is required from the Taelo Molosioa St. Yet the intersection still functions with an unacceptable LOS E.

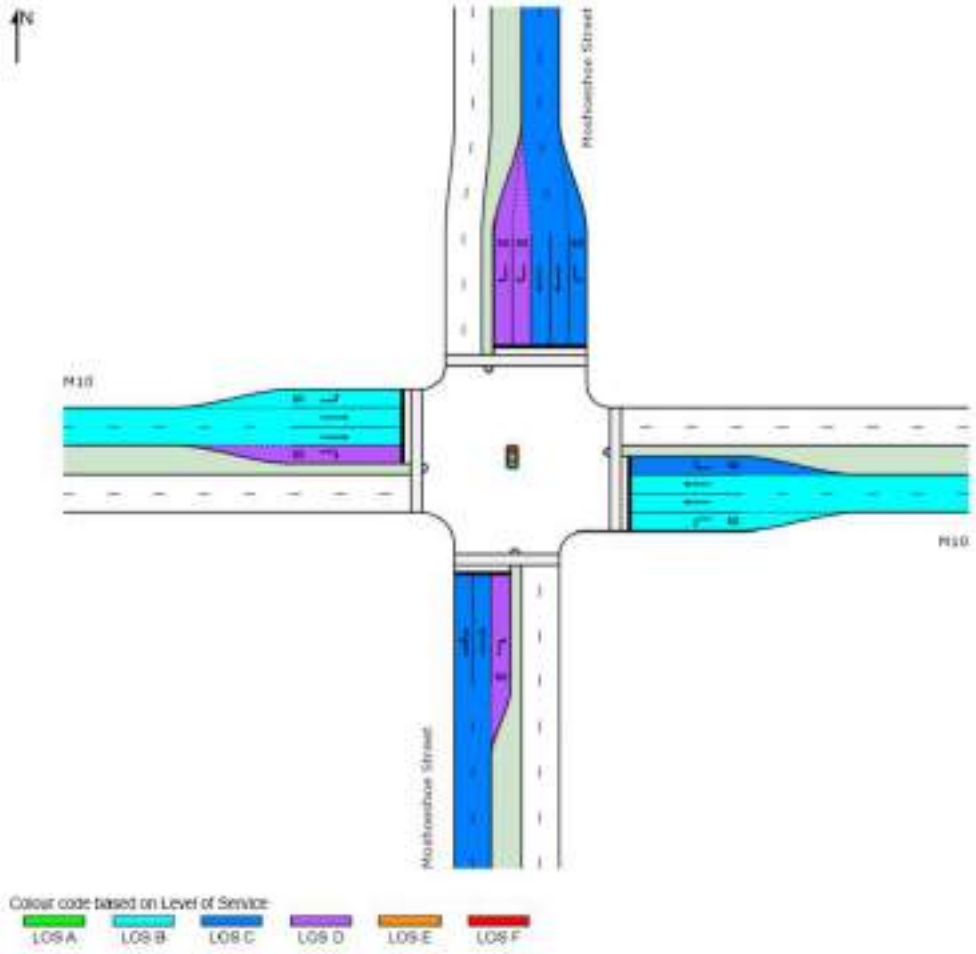
	Approaches				Intersection
	South	East	North	West	
LOS	F	D	C	D	E



(h) Intersection 36: M10 & Moshoeshoe Street

The proposed layout to accommodate the Latent demand is sufficient to accommodate the Klipfontein Development. Refer to the figure below

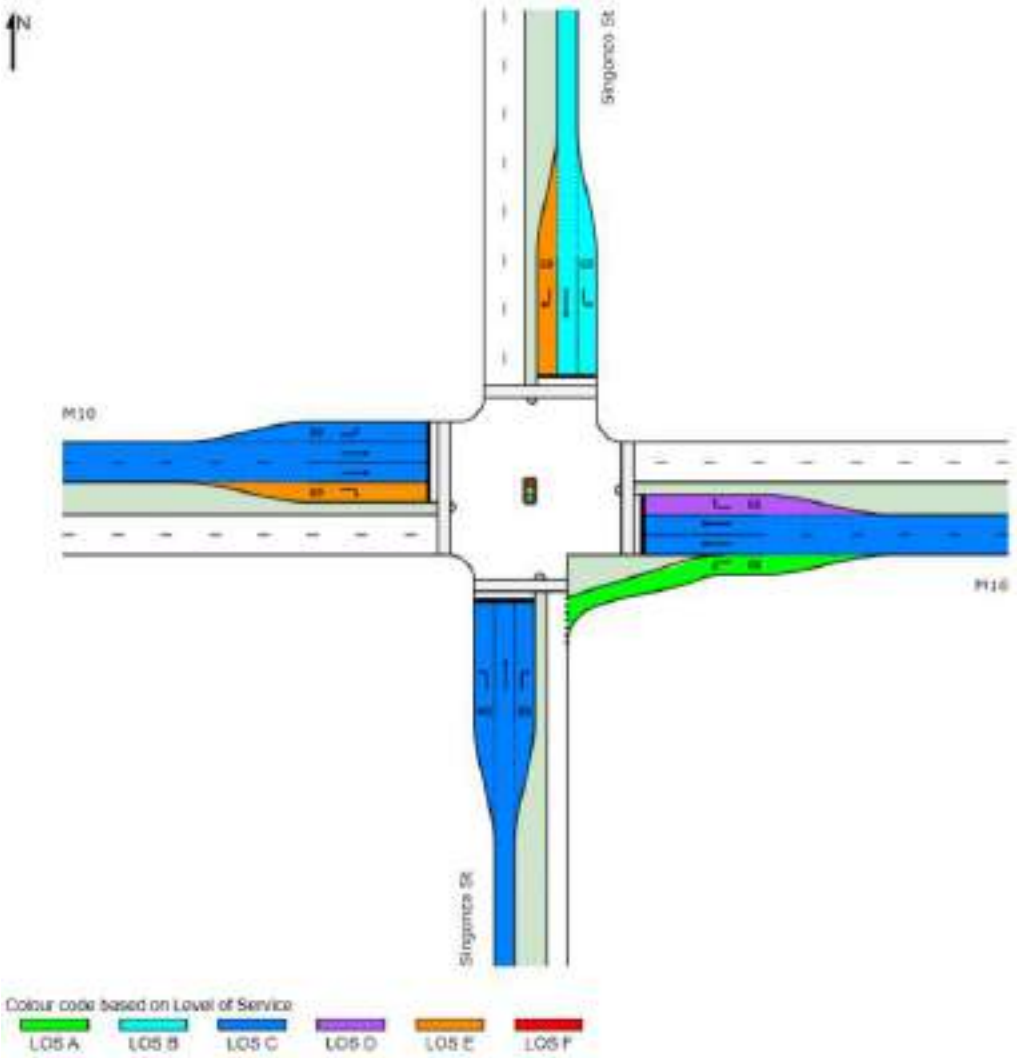
	Approaches				Intersection
	South	East	North	West	
LOS	C	B	C	B	C



(i) Intersection 37: M10 & Singonzo Street

The M10 /Singonzo St intersection must be upgraded to a signalised intersection with the proposed geometry as required for the latent demand.

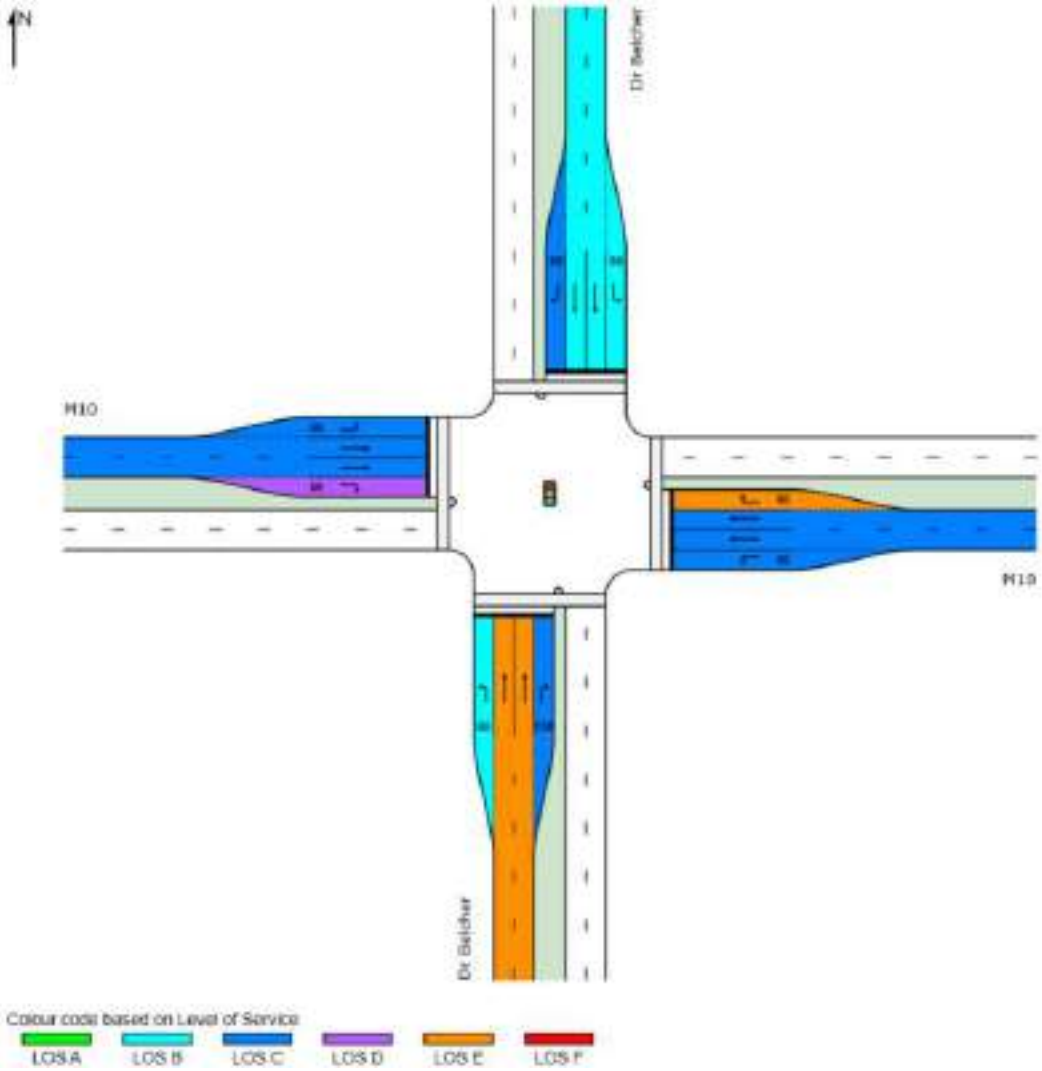
	Approaches				Intersection
	South	East	North	West	
LOS	C	C	C	C	C



(j) Intersection 38: M10 & Dr Belcher Road

The proposed layout to accommodate the Latent demand is sufficient to accommodate the Klipfontein Development. Refer to the figure below.

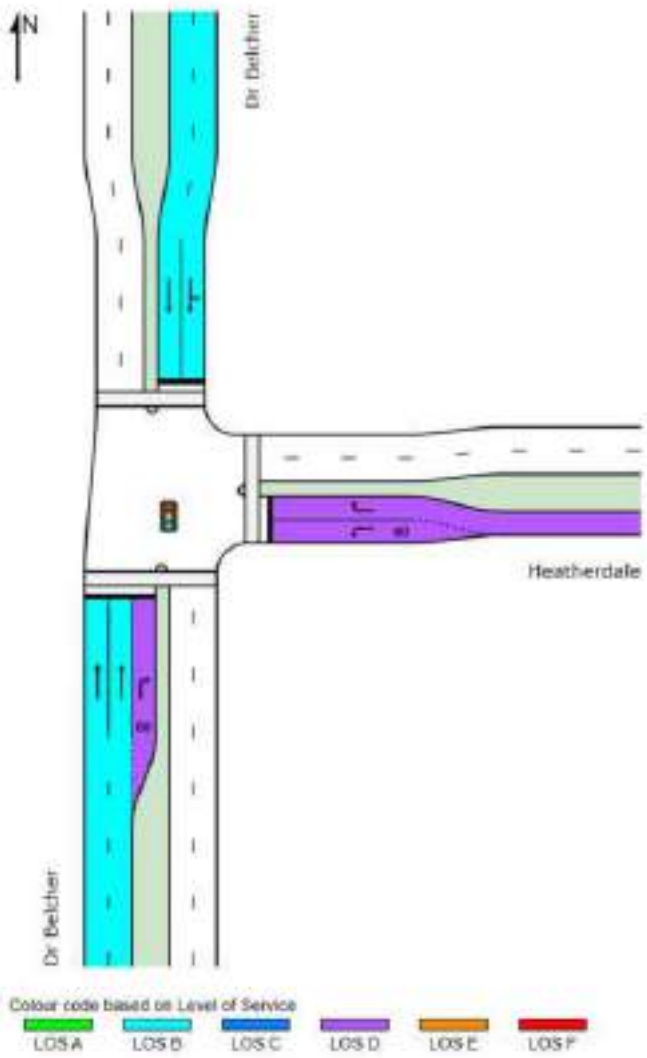
	Approaches				Intersection
	South	East	North	West	
LOS	D	D	B	C	D



(k) Intersection 40: Dr Belcher & Heatherdale Road

The proposed layout to accommodate the Latent demand is sufficient to accommodate the Klipfontein Development. Refer to the figure below.

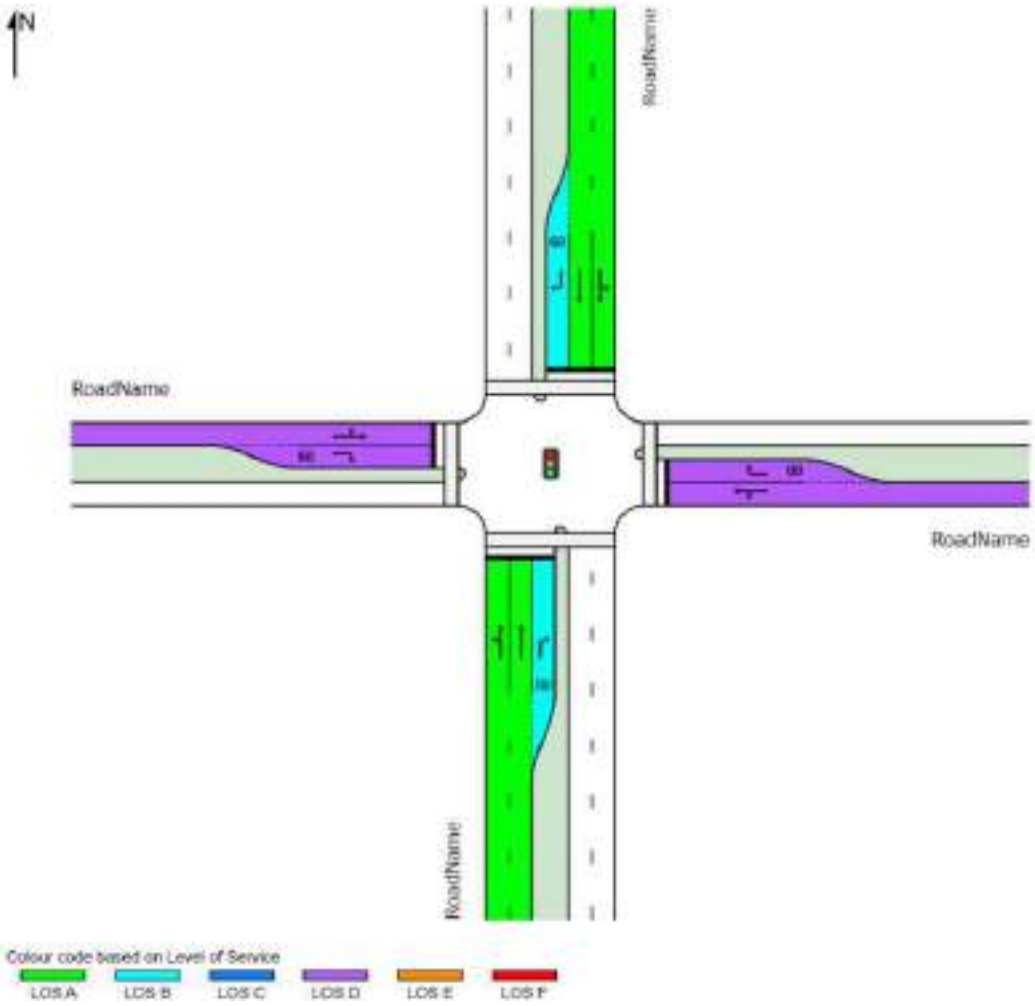
	Approaches			Intersection
	South	East	North	
LOS	B	D	B	C



(l) Intersection 41: Dr Belcher & Anna Magerman Crescent

The proposed layout to accommodate the Latent demand is sufficient to accommodate the Klipfontein Development. Refer to the figure below.

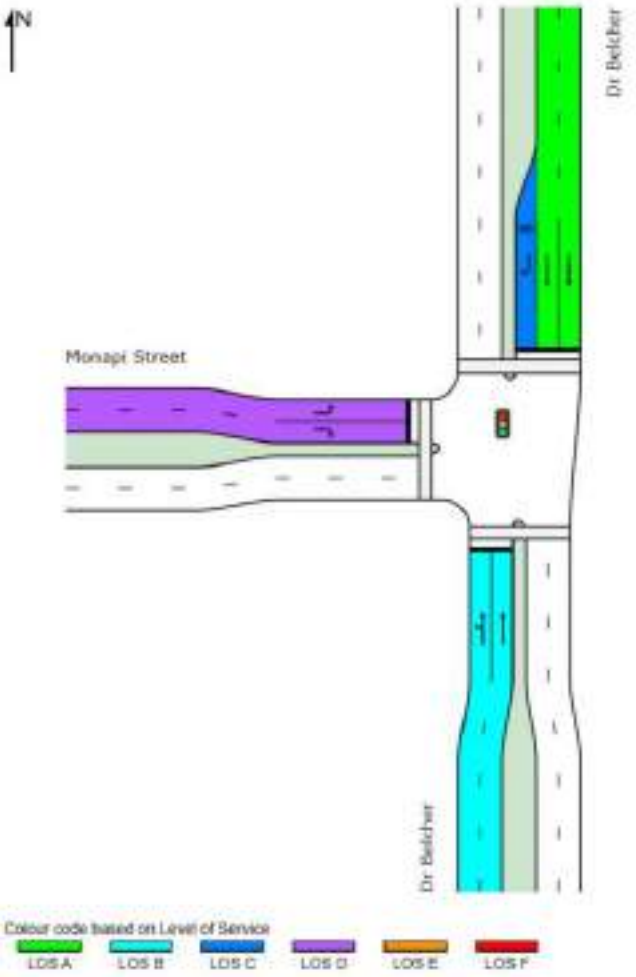
	Approaches				Intersection
	South	East	North	West	
LOS	A	D	A	D	A



(m) Intersection 42: Dr Belcher & Monapi Street

The proposed layout to accommodate the Latent demand is sufficient to accommodate the Klipfontein Development. Refer to the figure below.

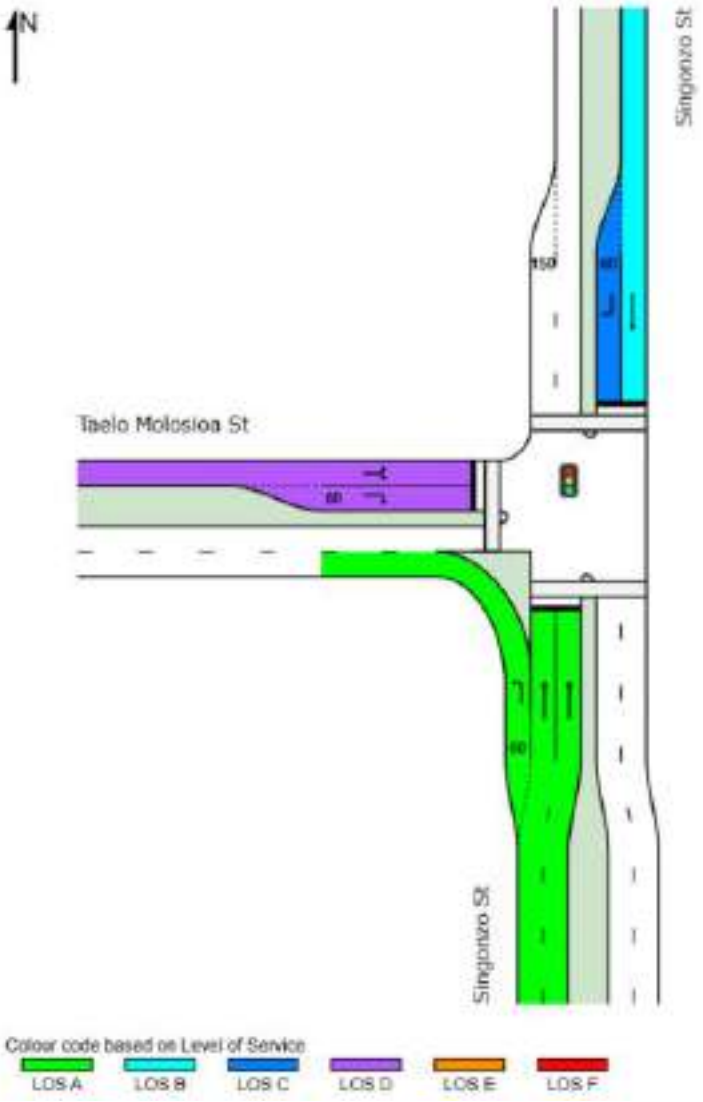
	Approaches			Intersection
	South	North	West	
LOS	B	A	D	B



(n) Intersection New: Singonzo St/ Taelo Molosioa St

This is a proposed new interaction due to the impact of the proposed development. This intersection requires signalisation, right turn lanes from both the northern and western approaches and left turn high angle slip lane from the southern approach. .

	Approaches			Intersection
	South	North	West	
LOS	A	B	D	B



5.5 2032 Year + Latent Rights + Klipfontein Development

Due to issues with the software package SATURN during the Stages of lockdown, the analysis was conducted using SIDRA for the AM peak. The latent demand volumes were extracted from the previously approved Mangaung SATURN 2032 scenario model. The trips generated by the Klipfontein development were distributed in accordance to the attraction zones and assessed as individual intersections in conjunction with the proposed latent demand distribution scenarios. The intersections assessed were those identified in chapter 3.

The movement summaries of the assessed intersections are shown in annexure F. The LOS and required infrastructure results identified affected intersections as identified in chapter 3 are shown below for the 2032 growth scenario.

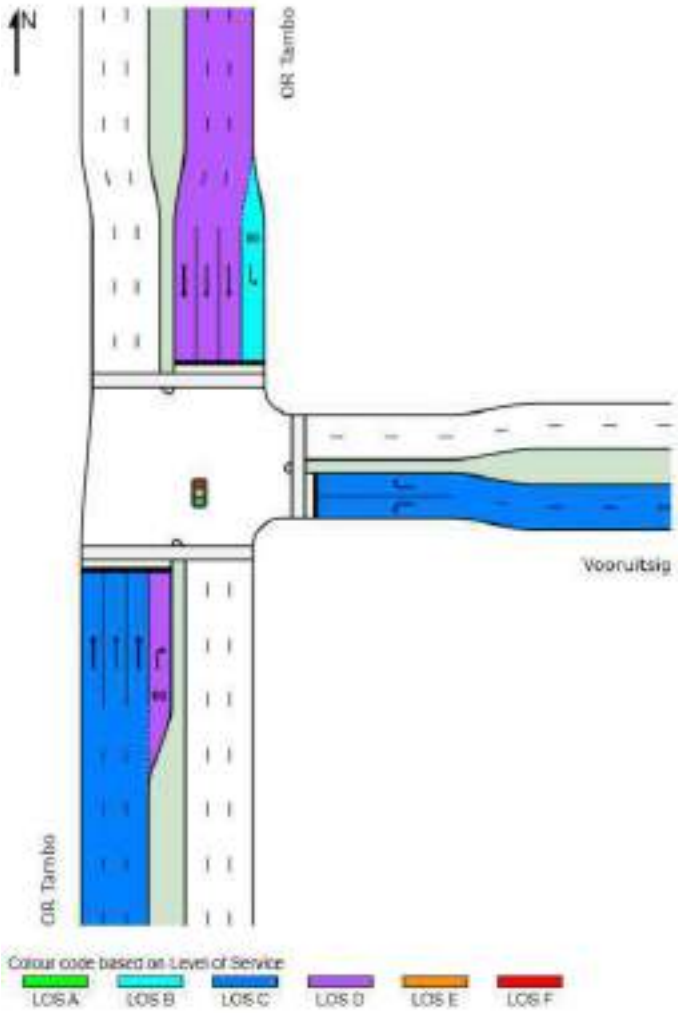
(a) Intersection 16: Harvey Road & OR Tambo

From the analysis of the Latent demand for 2032. The west approach will be operating at poor LOS F in the AM peak hour and at poor LOS F in the PM peak hour. The north approach will be operating at a poor LOS F in the PM peak hour. The east approach will be operating at a poor LOS E in the PM peak hour. This intersection has been upgraded to the maximum and therefore no further upgrades are proposed. Due to space constraints, the intersection could not be upgraded further to accommodate the latent and or the Klipfontein developments.

(b) Intersection 28: OR Tambo & Vooruitsig Street

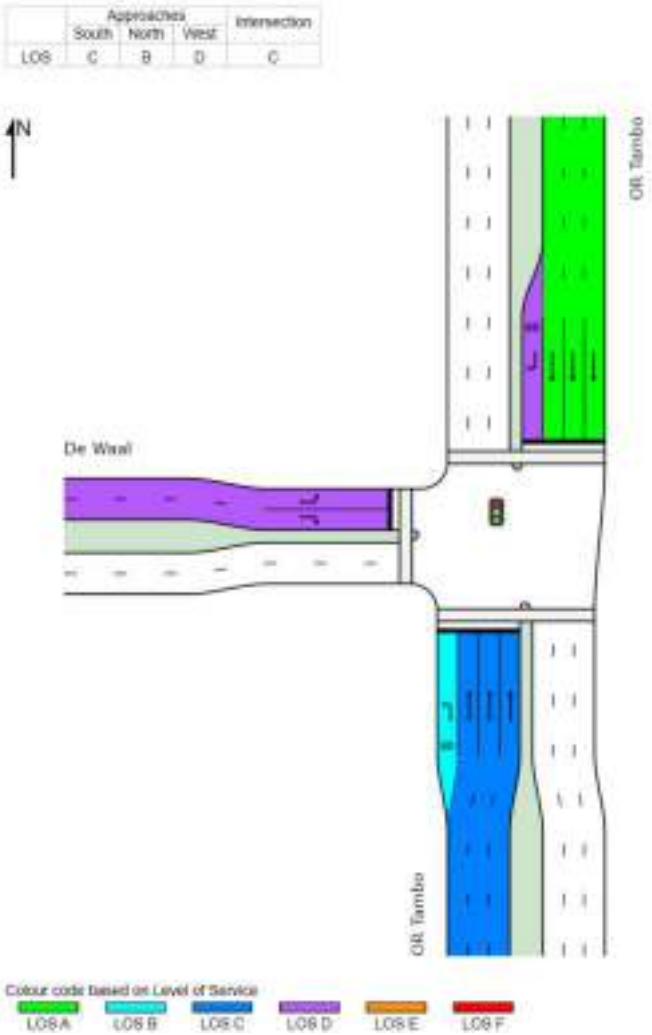
All approaches will be operating at acceptable LOS in the AM and PM peak hours as per the layout below with an additional through northbound lane. This is includes the Klipfontein development trips Refer to the figure below.

	Approaches			Intersection
	South	East	North	
LOS	C	C	D	D



(c) Intersection 29: OR Tambo & De Waal Road

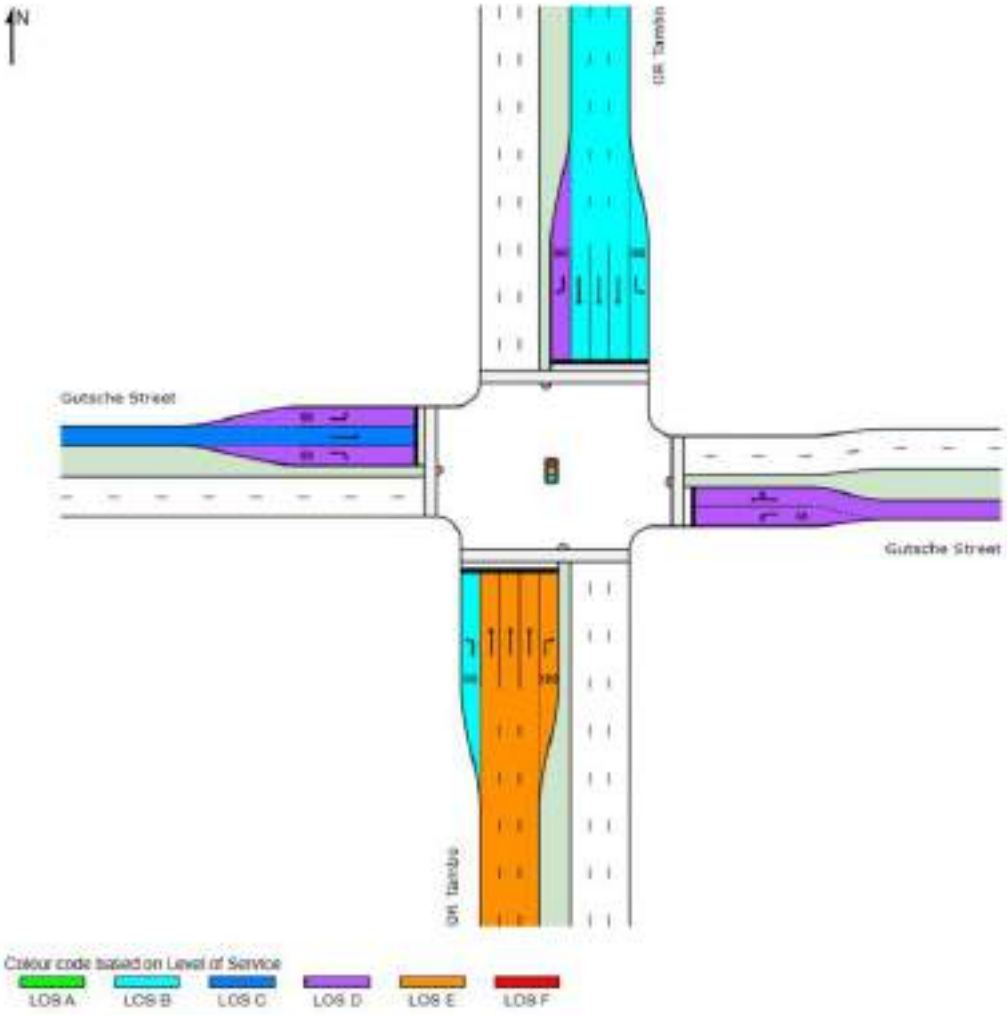
The proposed layout as per the latent demand recommendations satisfies the capacity of the latent demand and the Klipfontein Development. The LOS is shown in the Figure below:



(d) Intersection 30: OR Tambo & Gutsche Street

The overall intersection functions acceptably with the applied latent demand and future Klipfontein trips as per the recommended improvements proposed for the 2032 latent demand trips. The proposed layout and signalisation satisfies the trip demand. The LOS lane analysis is shown in the Figure below:

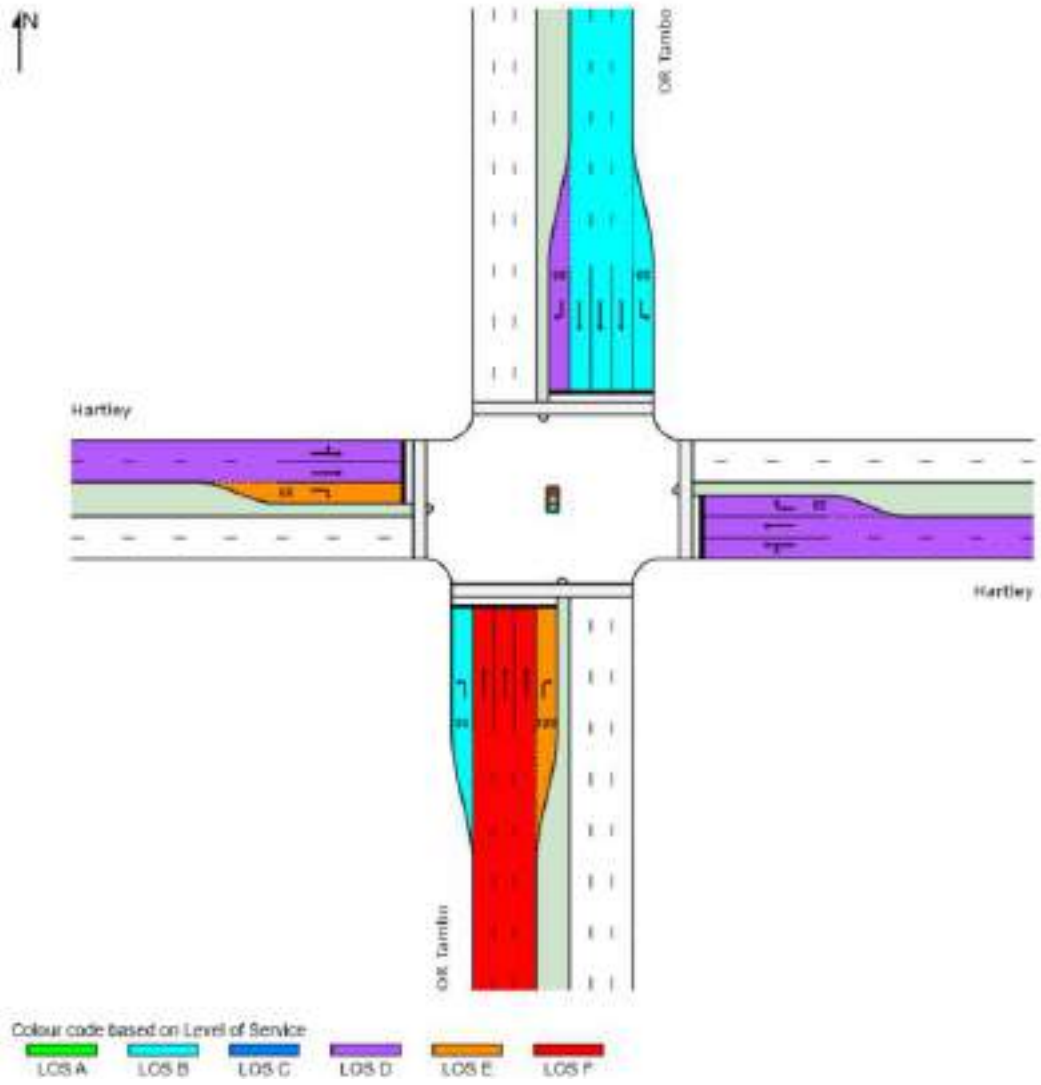
	Approaches				Intersection
	South	East	North	West	
LOS	E	D	B	D	D



(e) Intersection 31: OR Tambo & Hartley Street

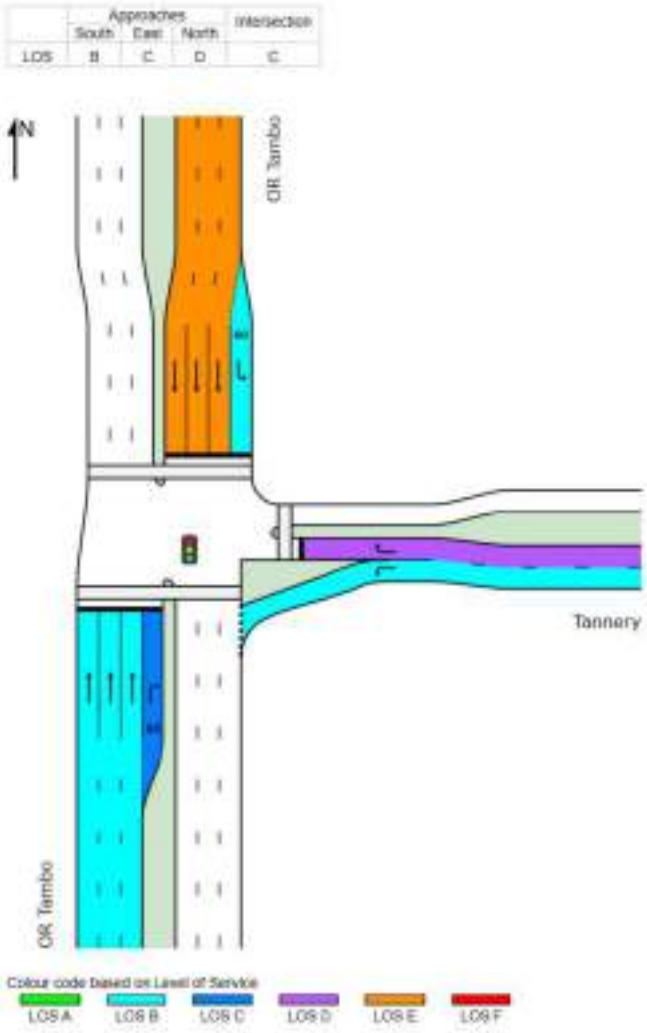
The south approach will be operating at a poor LOS F in the AM peak. This is worsened with the addition of the Klipfontein development trips. However, the total allowable space has been used to improve the intersection. As per the recommendations for the latent demand, a third additional through lane is proposed on the south approach. Refer to the figure below:

	Approaches				Intersection
	South	East	North	West	
LOS	F	D	B	D	F



(f) Intersection 32: OR Tambo & Tannery Street

The north approach will be operating at a poor LOS E in the AM peak hour. A third additional through lane is proposed on the south approach as per the recommendations in latent right demand assessments. Refer to the figure below.



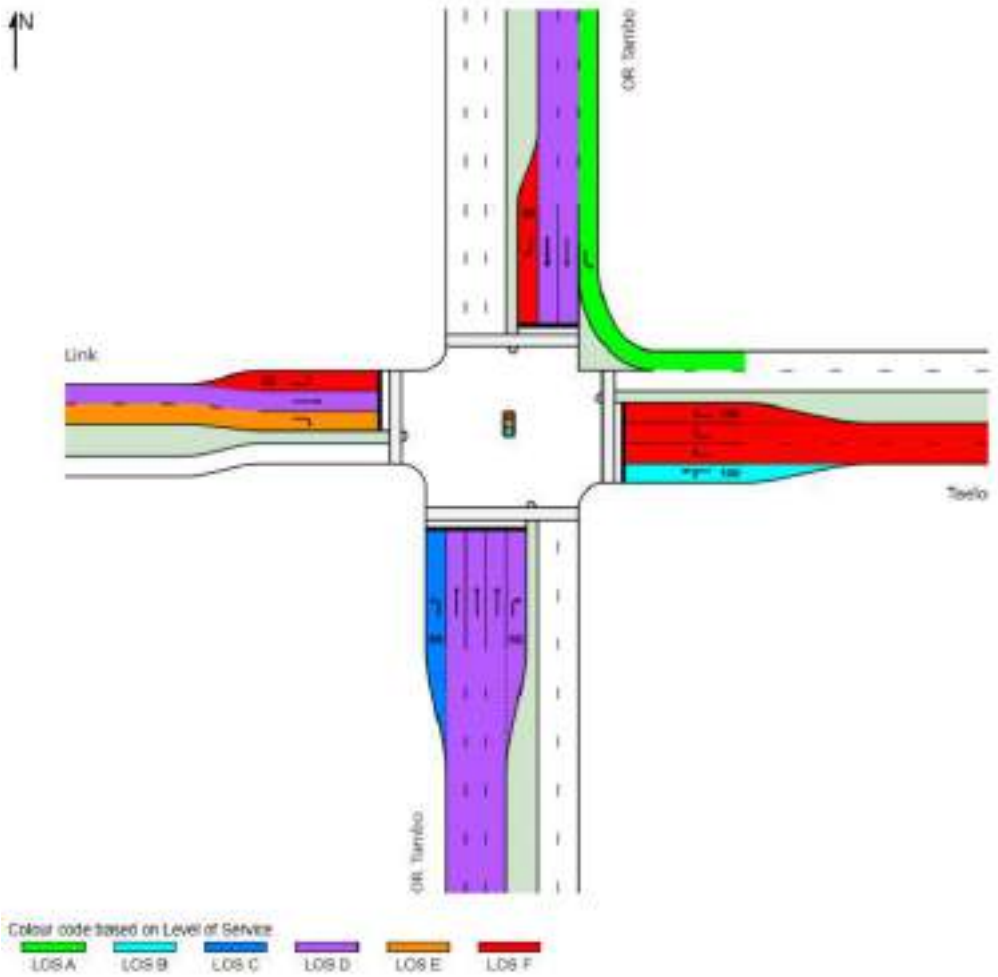
(g) Intersection 33: OR Tambo & M10

The intersection will be converted to a Diverging Diamond interchange (intersection 45 and Intersection 46). The proposed interchange will satisfy the trips generated by the Klipfontein development.

(h) Intersection 34: OR Tambo & Link Road

The proposed Klipfontein development results in the failure of the eastern approach. The intersection requires an additional right turn lane. Refer to the figure below.

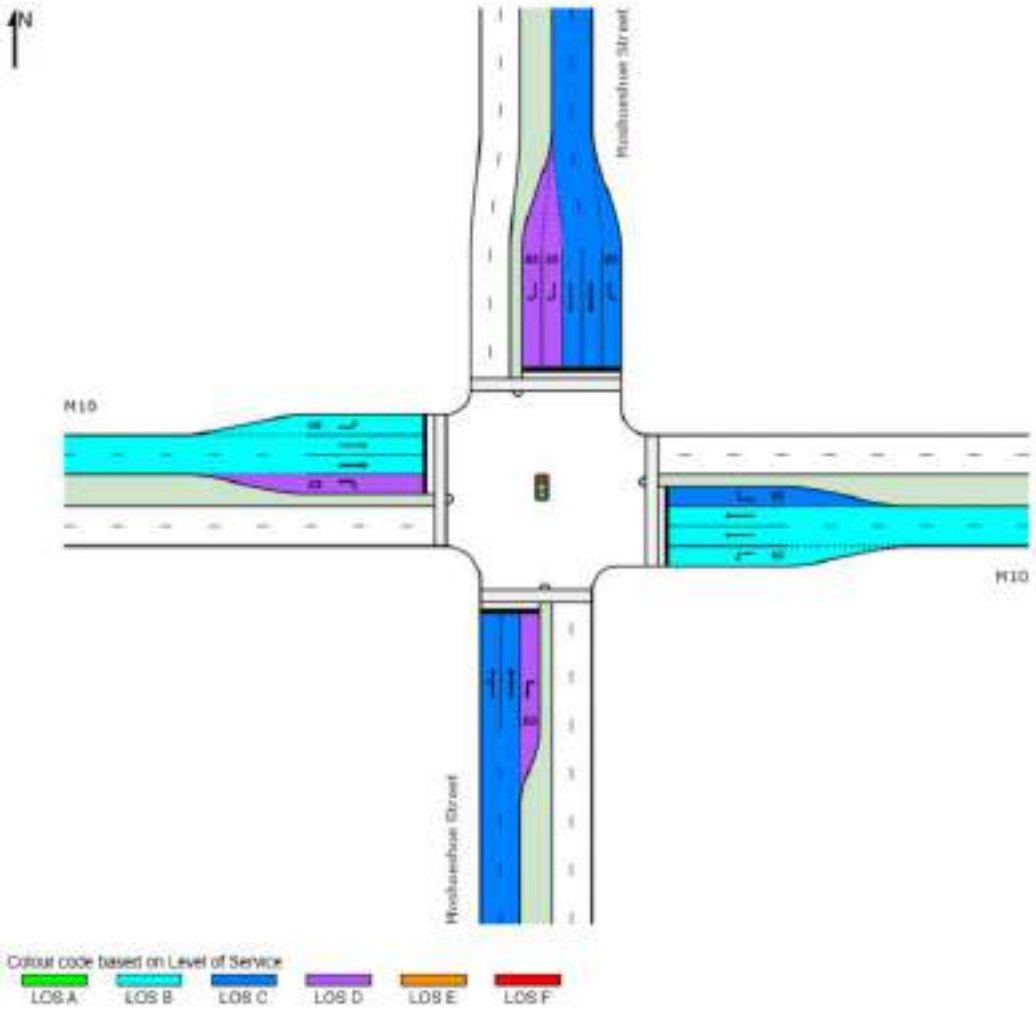
	Approaches				Intersection
	South	East	North	West	
LOS	D	E	C	E	D



(i) Intersection 36: M10 & Moshoeshoe Street

All approaches will be operating at acceptable LOS in the AM Peak. The increased trips generated by the Klipfontein development can be accommodated by the proposed intersection layout. Refer to the Figure below:

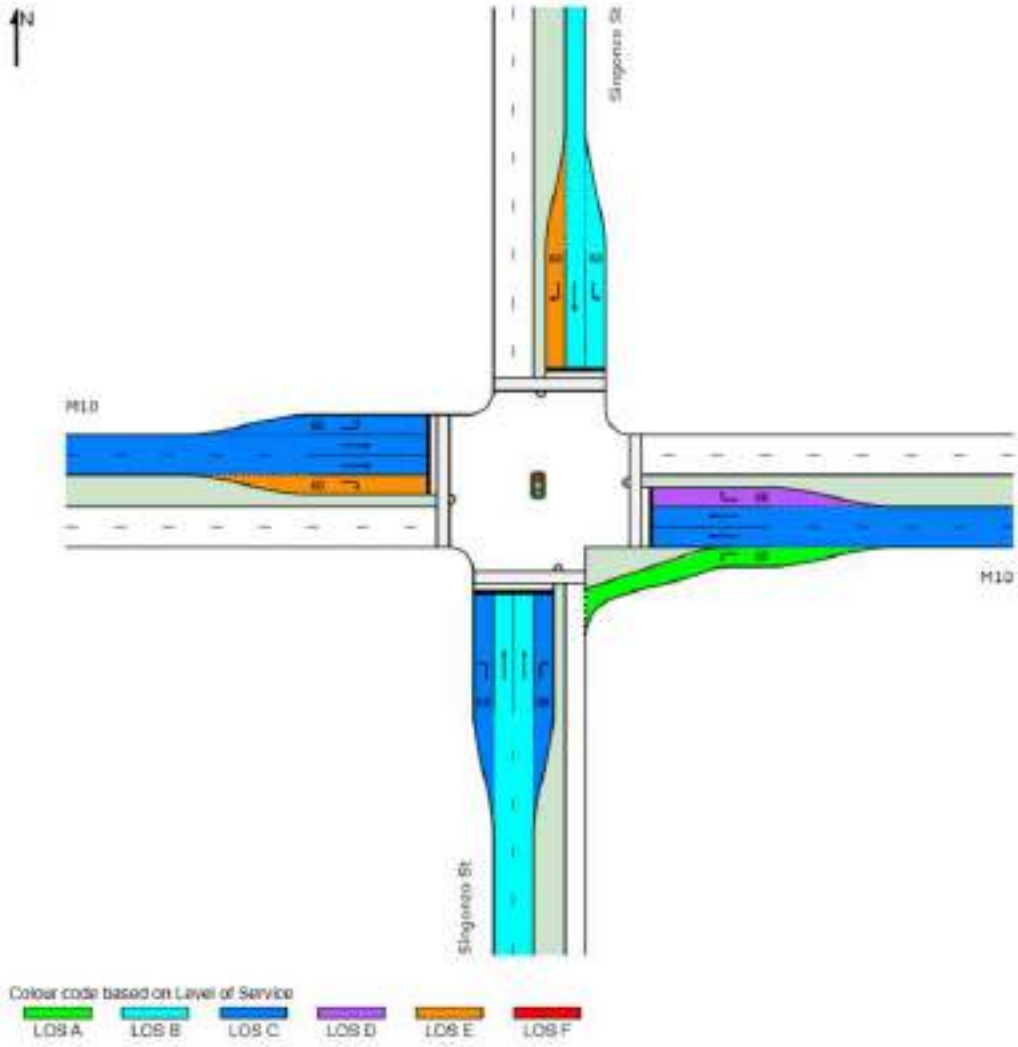
	Approaches				Intersection
	South	East	North	West	
LOS	C	B	C	B	C



(j) Intersection 37: M10 & Singonzo Street

As noted in the 2022 analysis, this intersection will be signalised. The signalised intersection will accommodate the trips generated by the development. However, the new minor arterial of Singonzo St will require an additional through lane. Refer to the figure below.

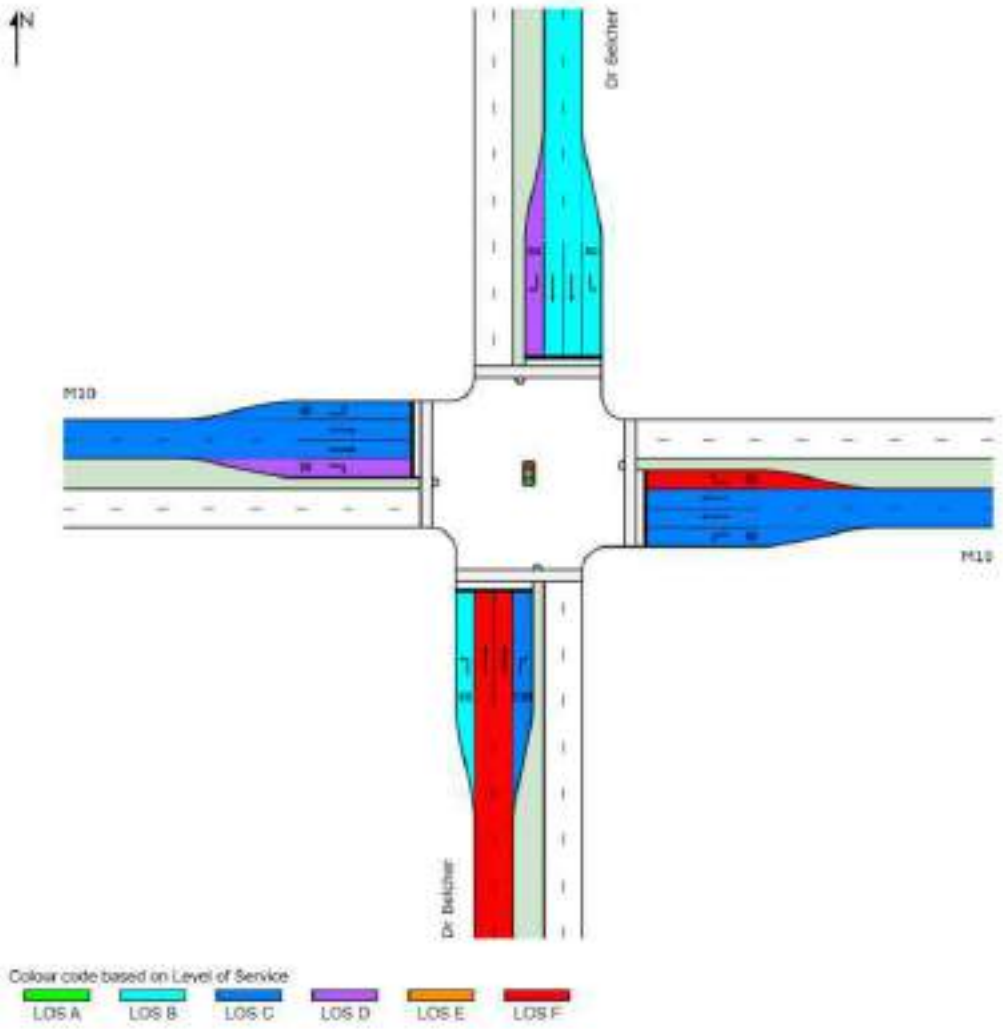
	Approaches				Intersection
	South	East	North	West	
LOS	C	C	D	C	C



(k) Intersection 38: M10 & Dr Belcher Road

The east and southern approach will be operating at poor LOS F in the AM peak hour as a result of the additional AM peak Klipfontein generated trips. Yet the overall intersections functions with a marginal LOS E. Refer to the figure below.

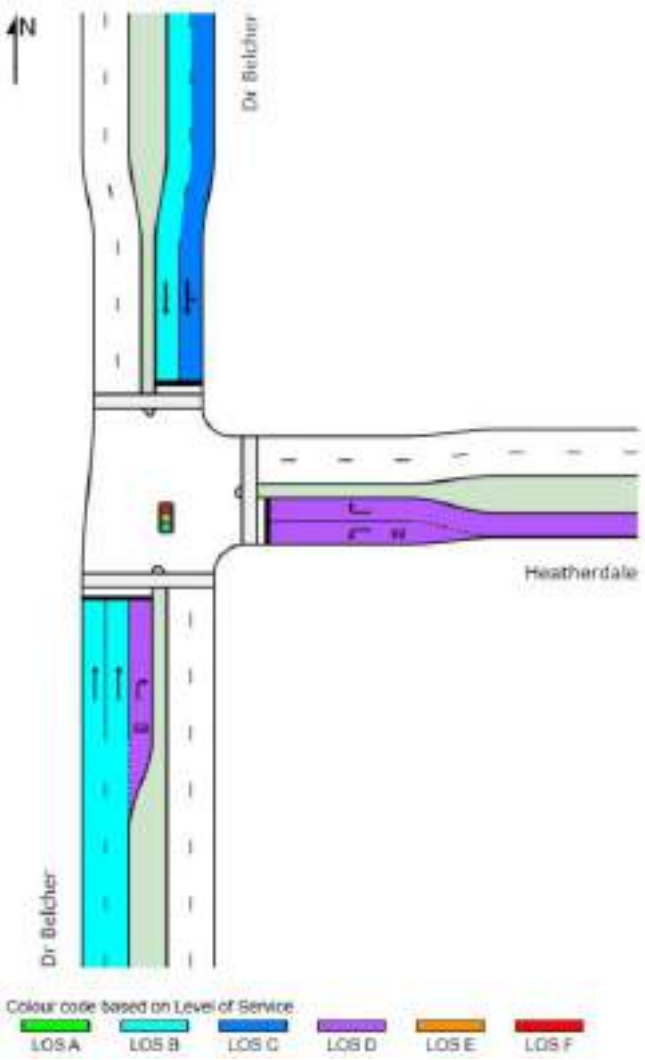
	Approaches				Intersection
	South	East	North	West	
LOS	F	D	C	C	E



(l) Intersection 40: Dr Belcher & Heatherdale Road

The proposed improvements to satisfy the latent demand furthermore satisfy the increased demand caused by the Klipfontein development.

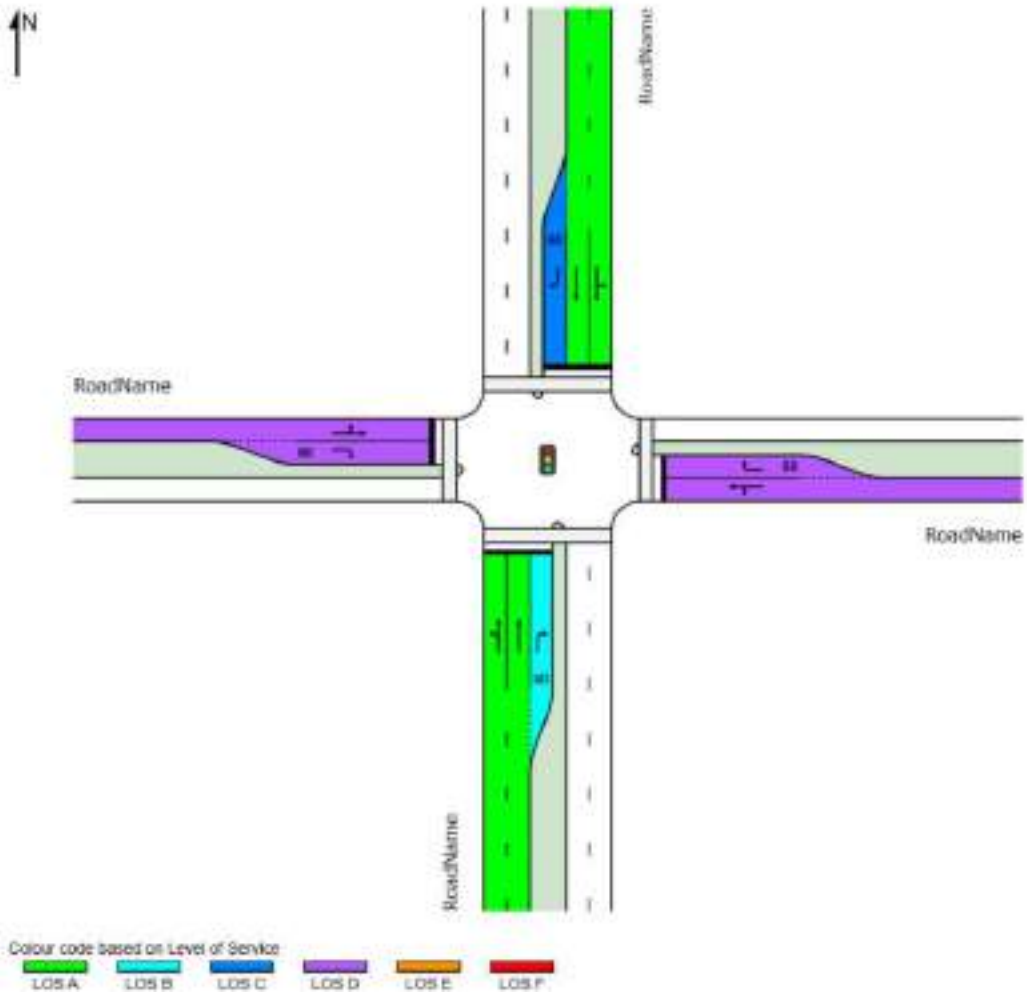
	Approaches			Intersection
	South	East	North	
LOS	B	D	B	C



(m) Intersection 41: Dr Belcher & Anna Magerman Crescent

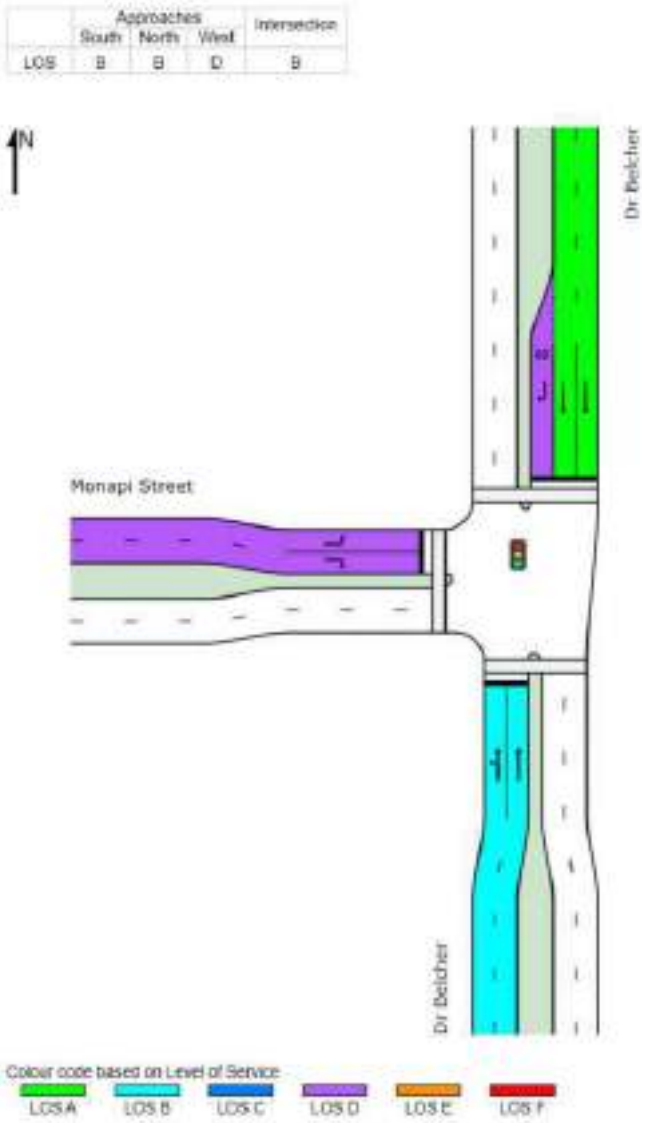
The proposed layout as per the requirements for the latent demand, satisfy the demand caused by the Klipfontein development. Refer to the figure below.

	Approaches				Intersection
	South	East	North	West	
LOS	A	D	A	D	A



(n) Intersection 42: Dr Belcher & Monapi Street

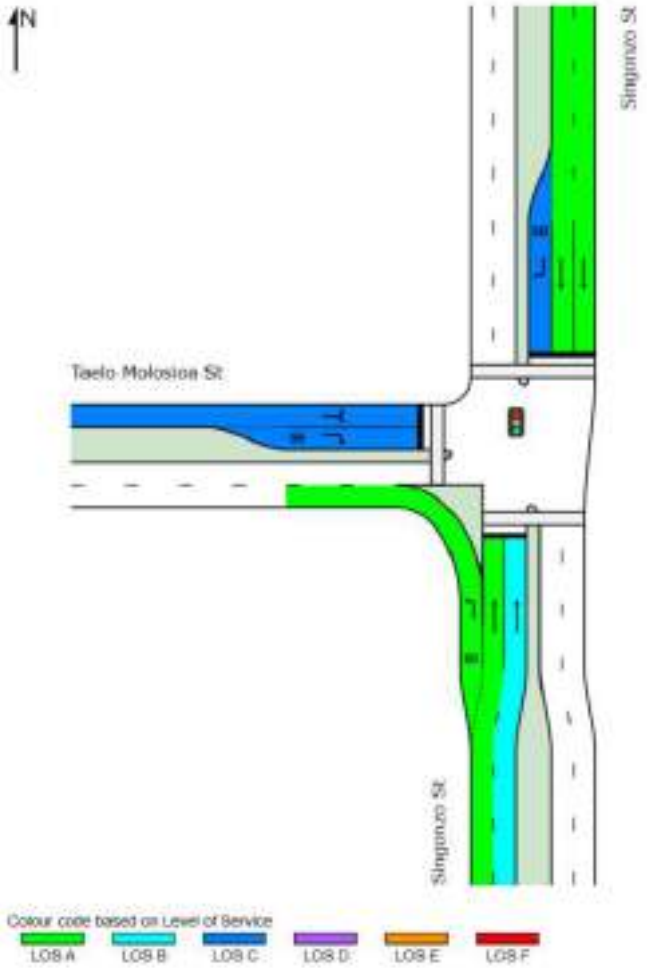
Again the proposed layout as per the requirements for the latent demand, satisfy the demand caused by the Klipfontein development. Refer to the figure below.



(o) Intersection New: Singonzo St/ Taelo Molosioa St

The proposed new intersections requires signalisation and requires a low angle slip lane from the south, a right turning lane from the west and duelling of the Arterial along Singonzo Street both north and south of the intersection. .

	Approaches			Intersection
	South	North	West	
LOS	A	A	C	B



6. ACCESSES AND INTERNAL INTERSECTION DESIGNS AND PROPOSED UPGRADES

The proposed accesses and internal intersections were then assessed and designed. This section of the analysis was done using SIDRA as micro-simulation assessment of these intersections is required. The accesses internal intersections were designed using the distributed trips as per chapter 4. The major intersections are shown in Figure below:

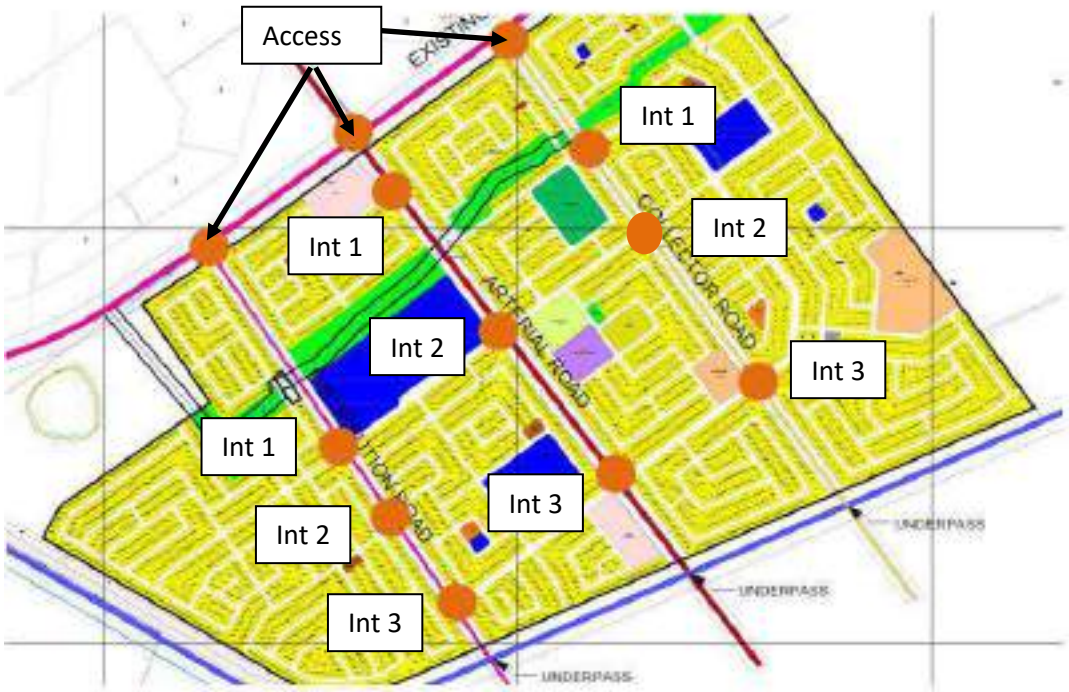
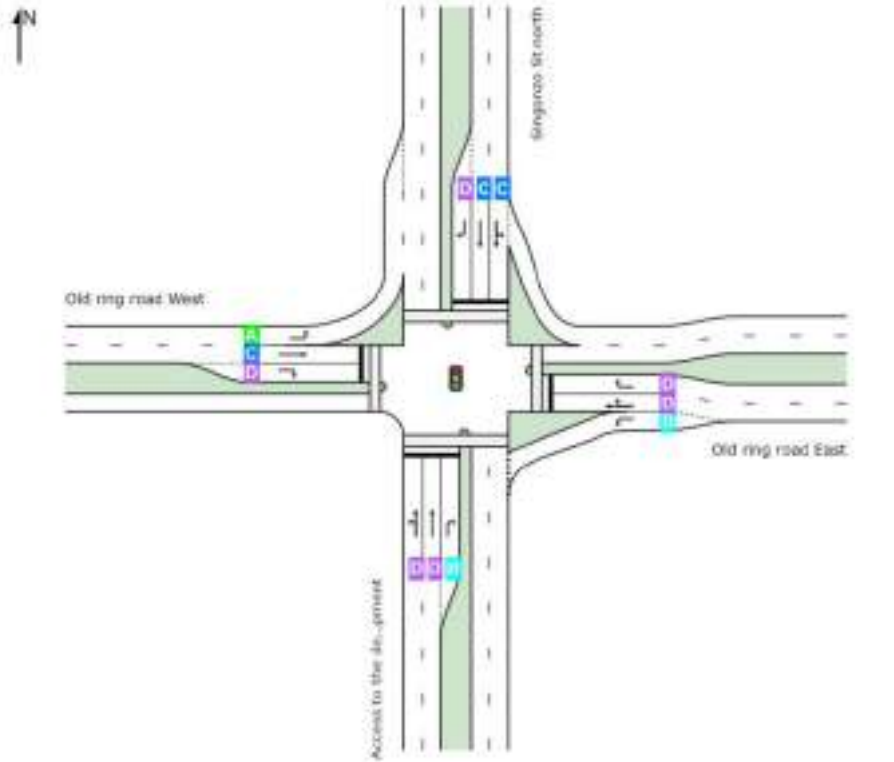
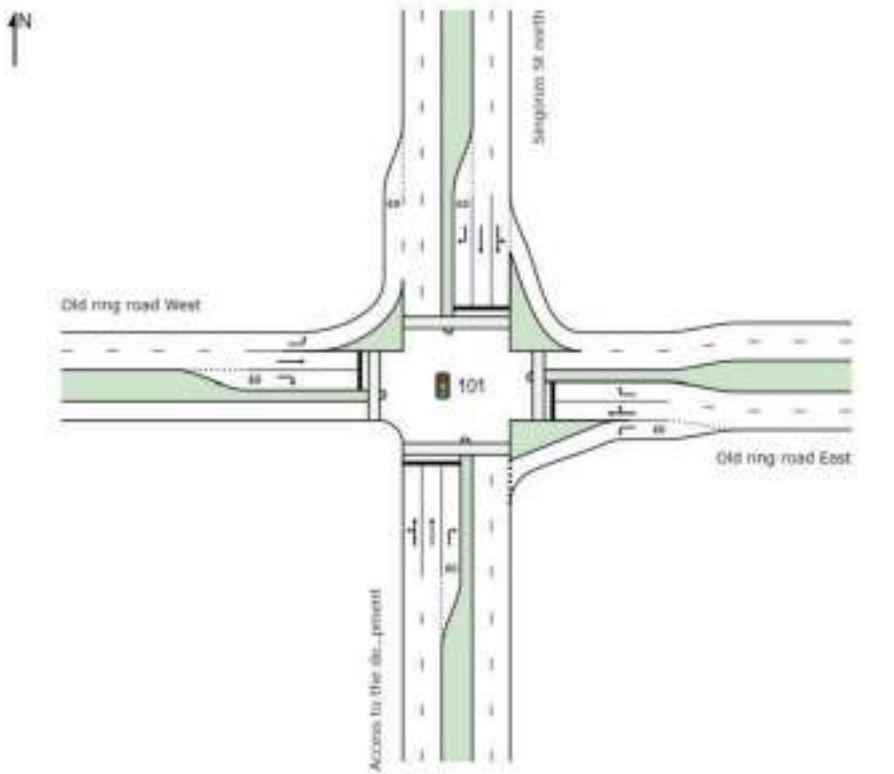


Figure 6-1: Location of Access and internal intersections

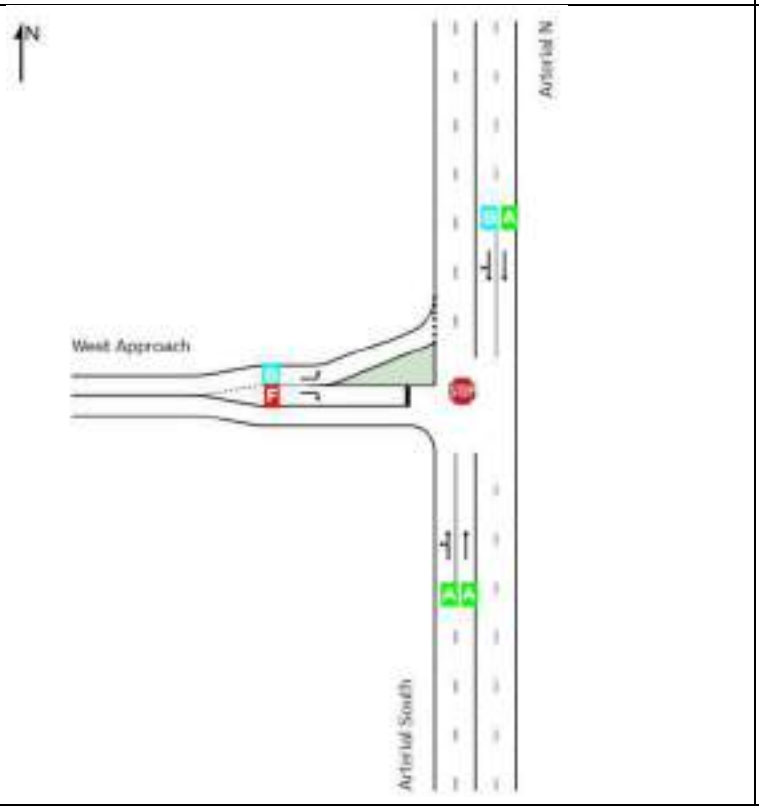
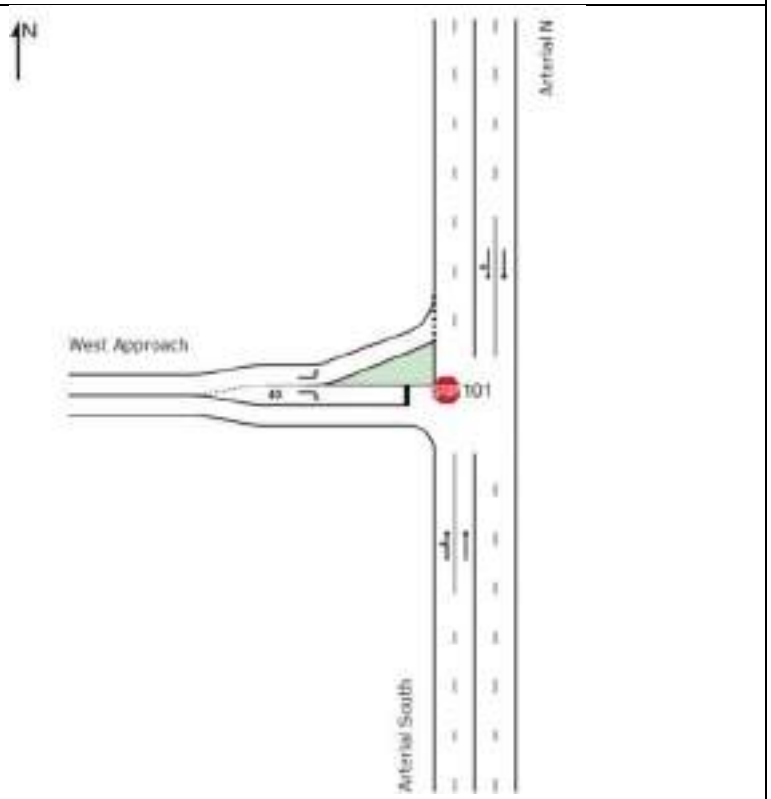
The movements summaries are located in Annexure L.

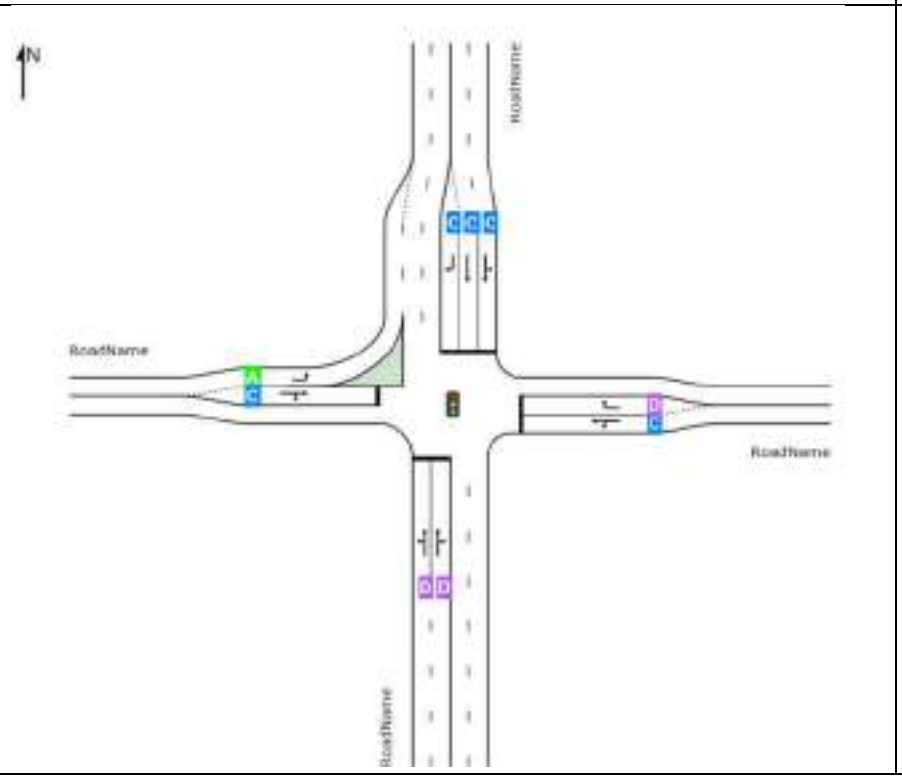
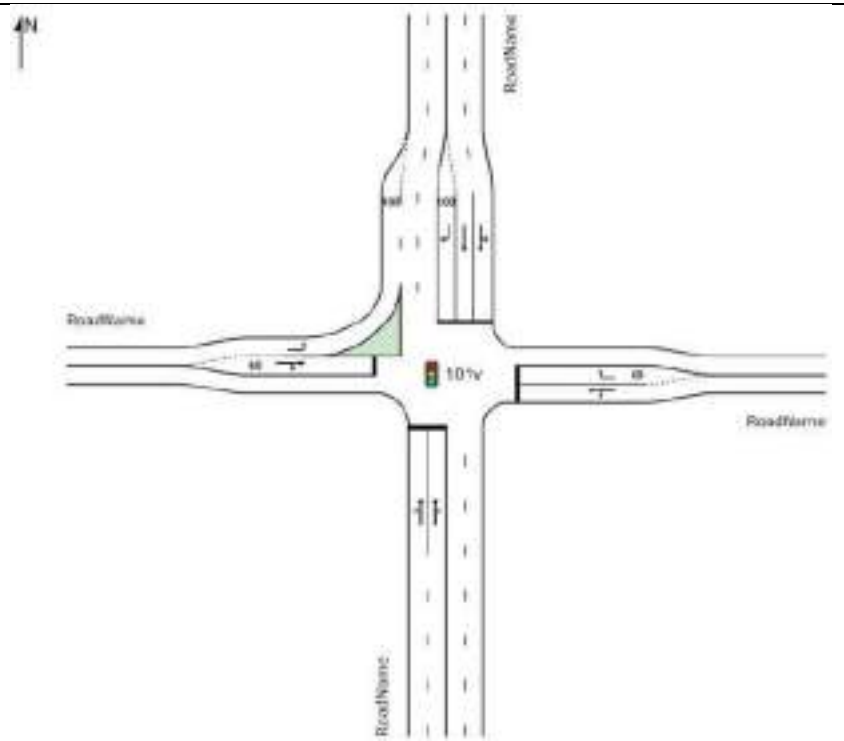
6.1 Arterial Access and internal intersections

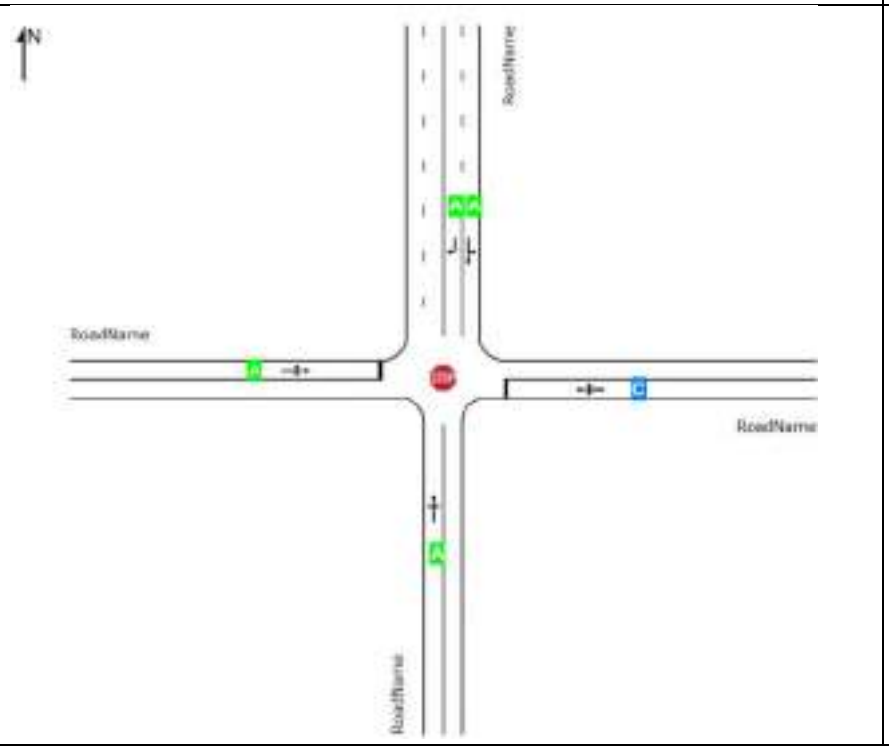
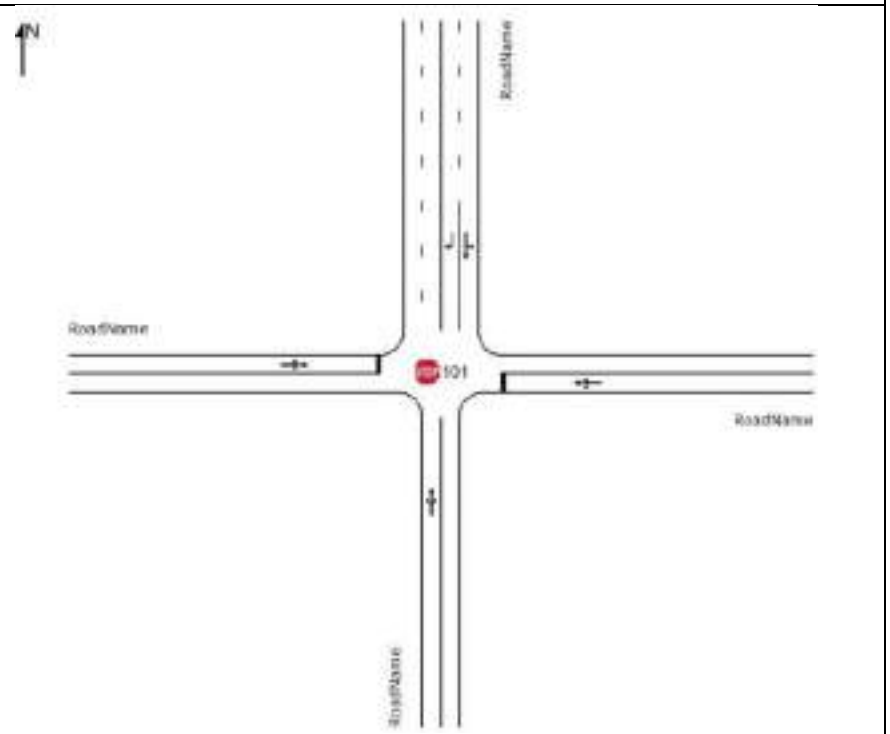
The proposed arterial forms the major access to the development. The proposed road is proposed to be a dual carriageway. There are 3 additional major intersections along the road within the development. The results of the analysis indicated that two signalised intersections are required and two stop streets are required.

AM Peak: Access	AM Peak: Access Layout
	

Notes: Dual Carriageway, signalised intersection. The proposed layout results in all movements operating with an acceptable LOS D

AM Peak: Intersection 1	AM Peak: Intersection 1 Layout
	
Notes: Due to the large traffic volumes along the arterial, the duelling of the carriageway was continued. The intersection functions acceptably as a stop street in AM peak. The failing movement west right turn with an LOS F is a minor movement of on 6 Vehicles.	

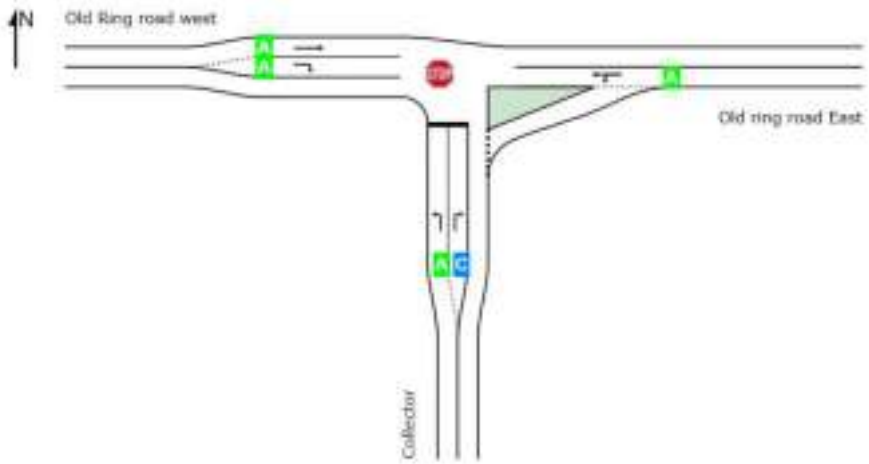
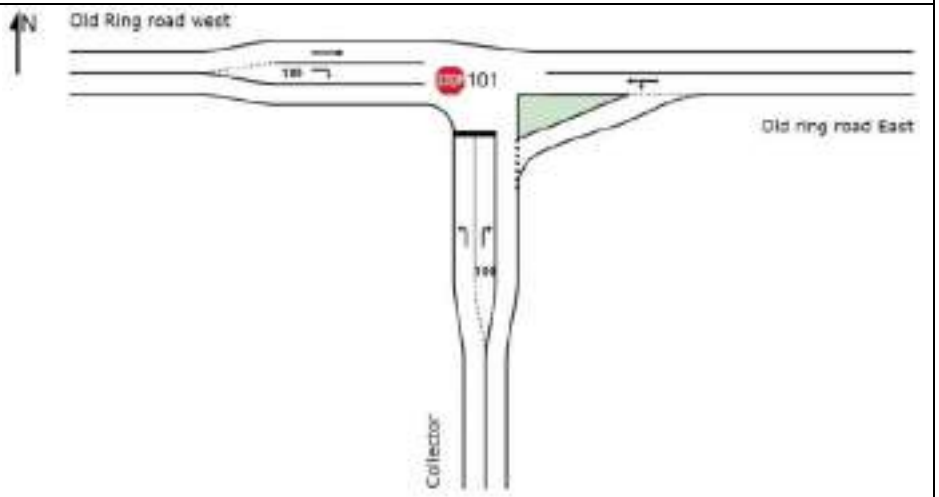
AM Peak: Intersection 2	AM Peak: Intersection 2 Layout
	
Notes: This is a major intersection within the development and attracts and generates a large volume of traffic. As a result to achieve an acceptable LOS, the intersection requires signalisation.	

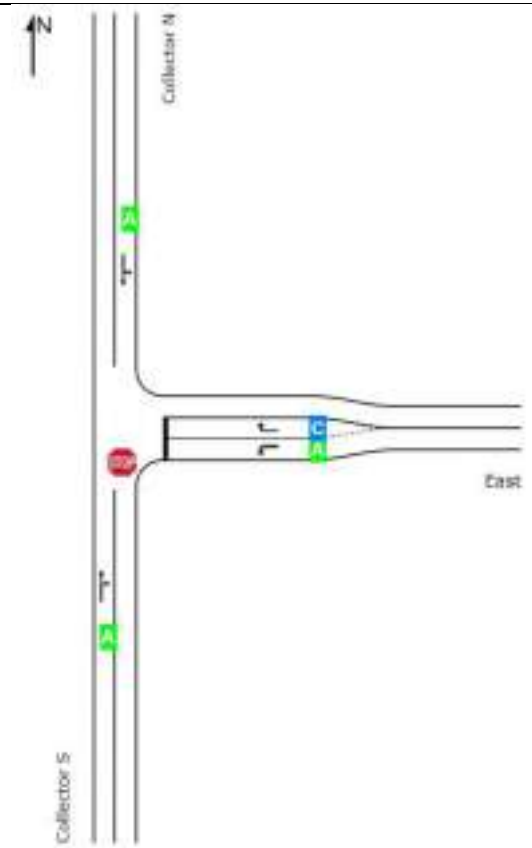
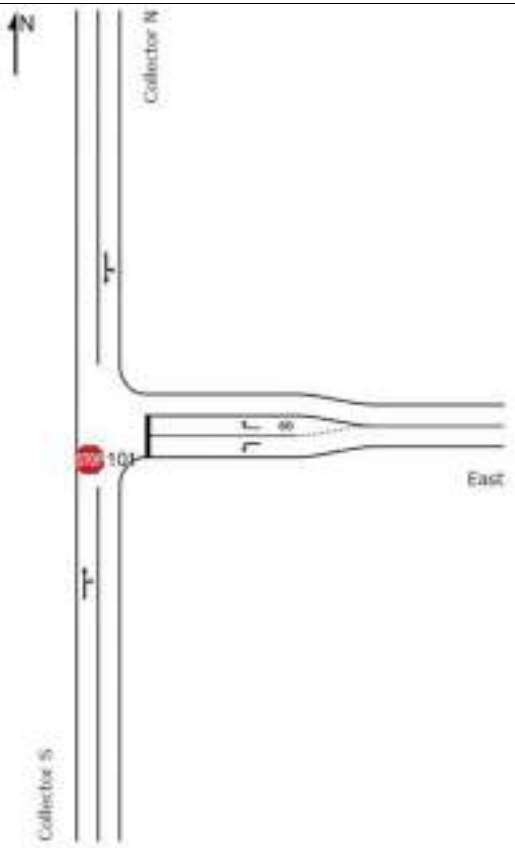
AM Peak: Intersection 3	AM Peak: Intersection 3 Layout
	

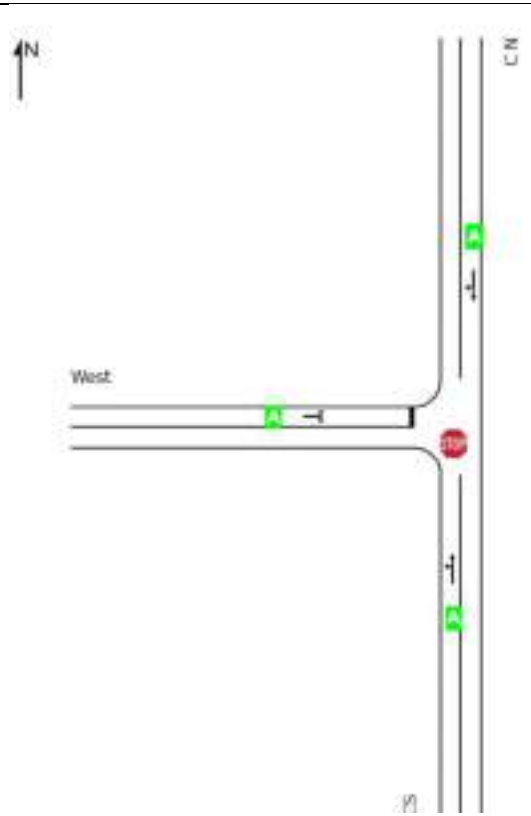
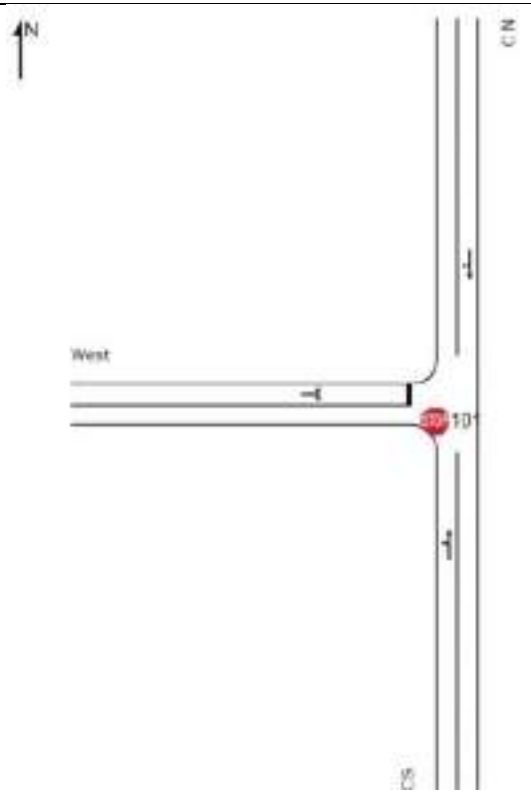
Notes: This intersection is located at the southern part of the development and as a result has lower volumes. The duelling of the arterial can cease at this intersection. The intersection functions acceptably as a stop street.

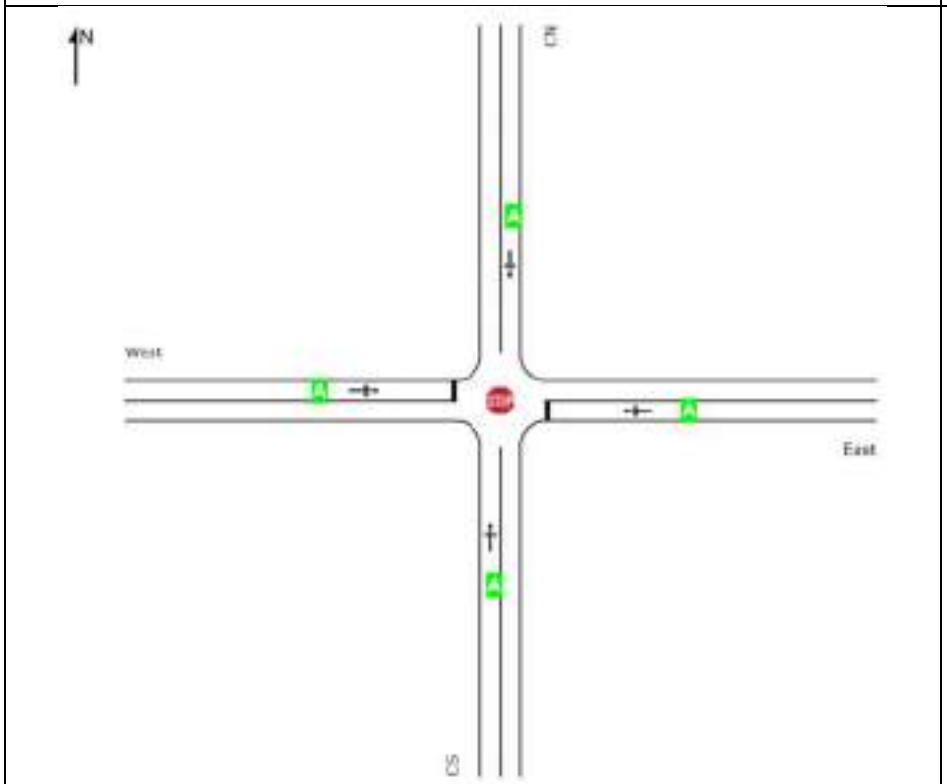
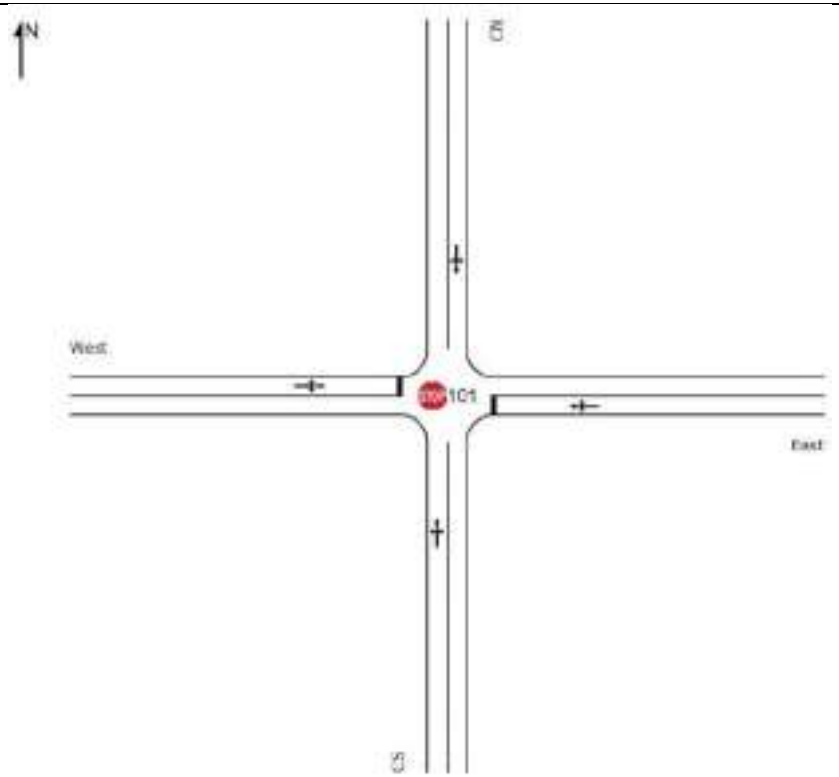
6.2 Collector East Access and internal intersections

This road has one major access to the development and 3 internal intersections. The intersections were all satisfied as priority controlled stop streets.

AM Peak: Access	AM Peak: Access Layout
	
Notes: The proposed layout results in the intersction achiving an acceptable LOS A.	

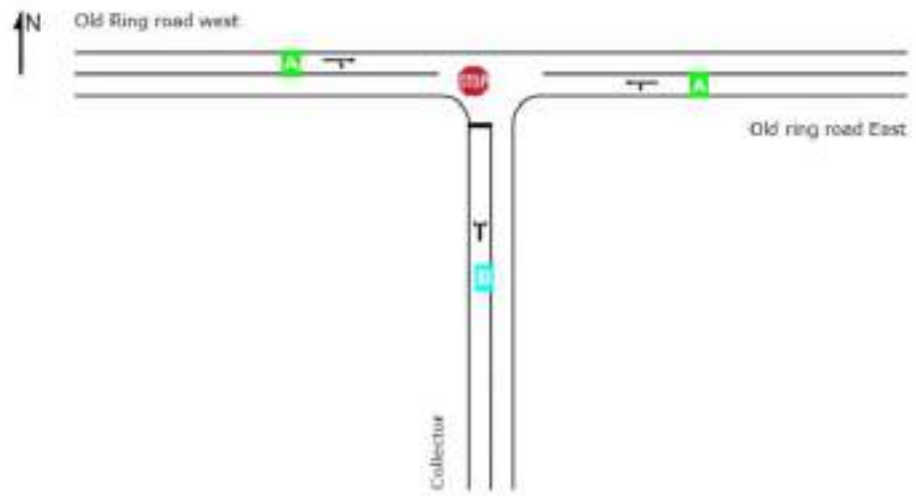
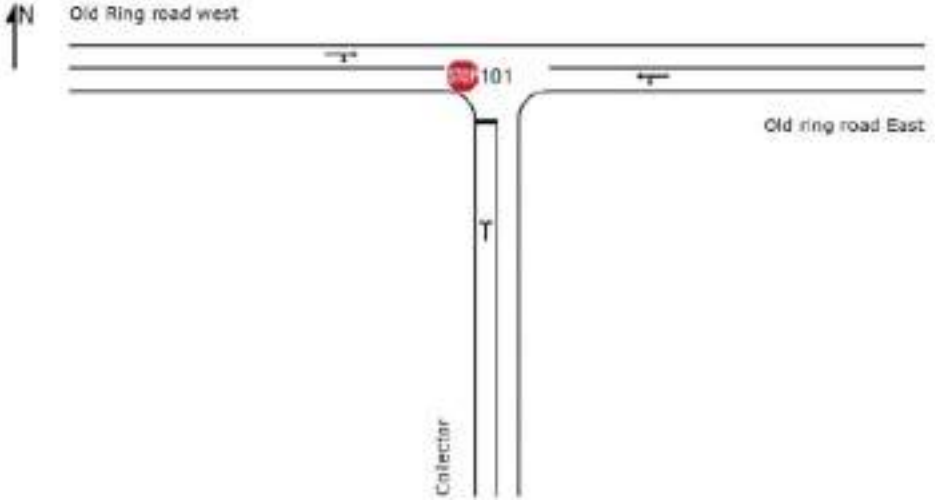
AM Peak: Intersection 1	AM Peak: Intersection 1 Layout
	
Notes: The proposed layout results in the intersection achieving an acceptable LOS A.	

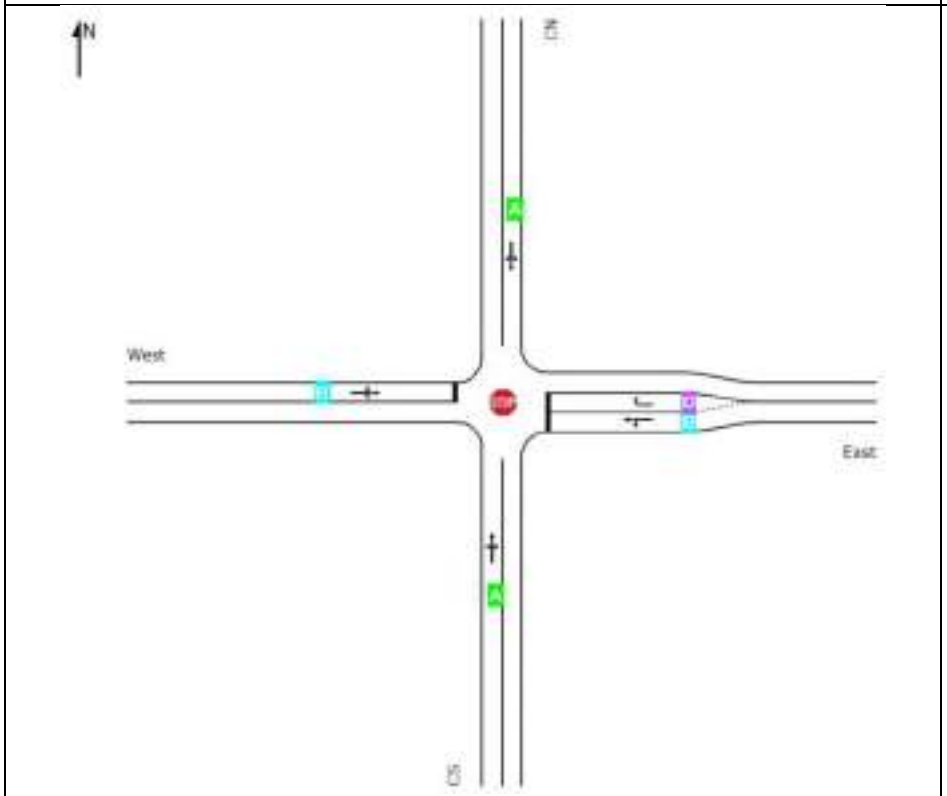
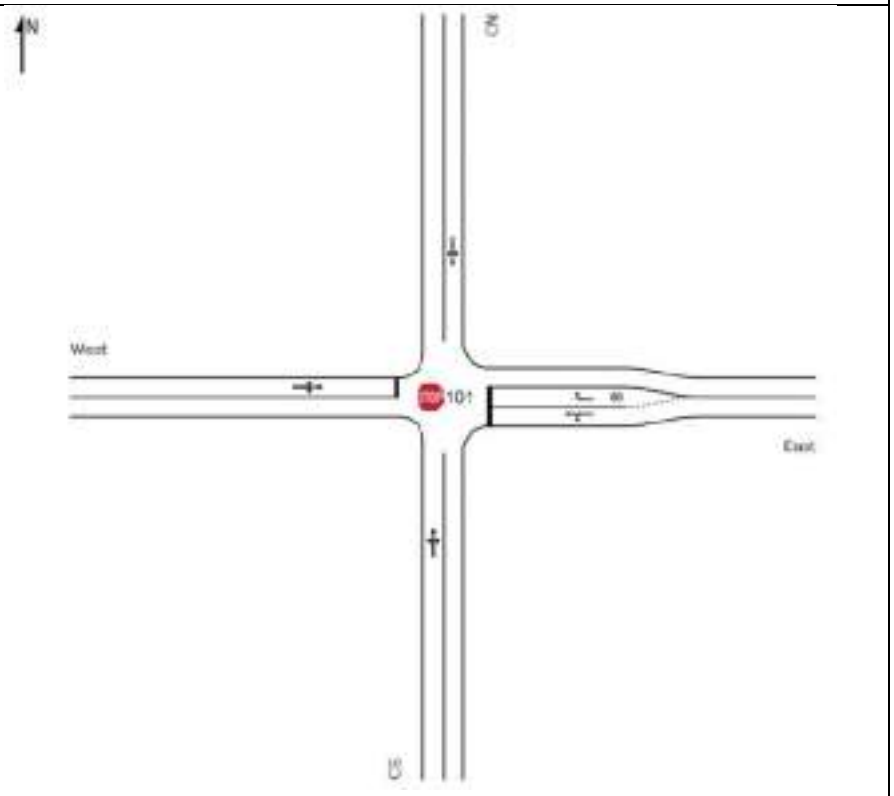
AM Peak: Intersection 2	AM Peak: Intersection 2 Layout
	
Notes: The proposed layout results in an acceptable LOS A.	

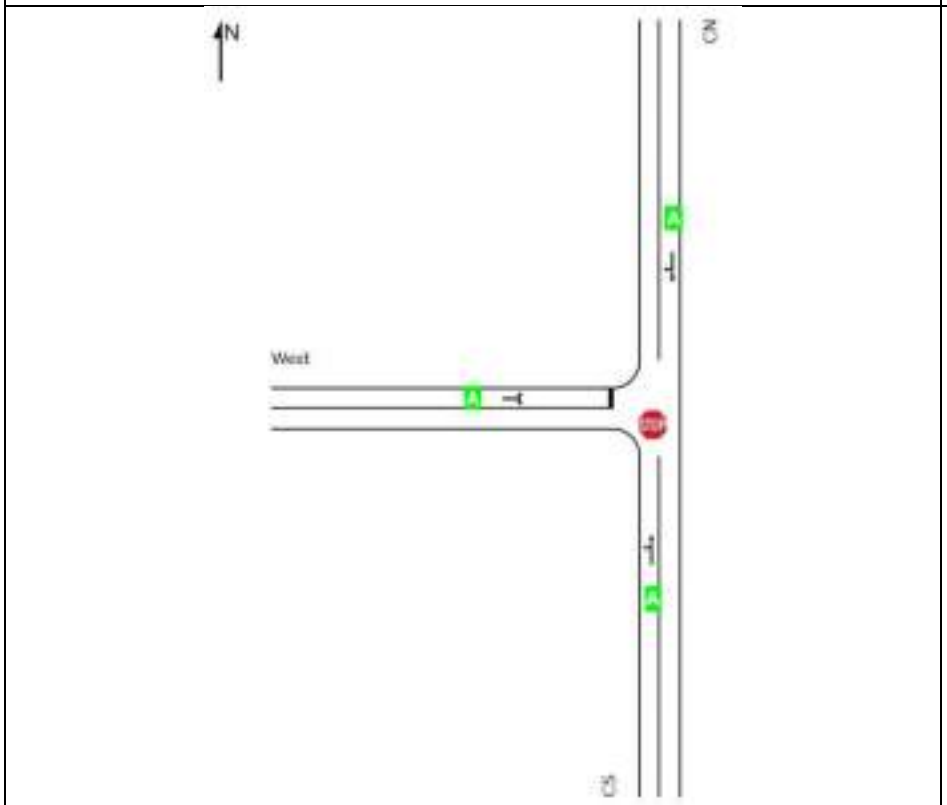
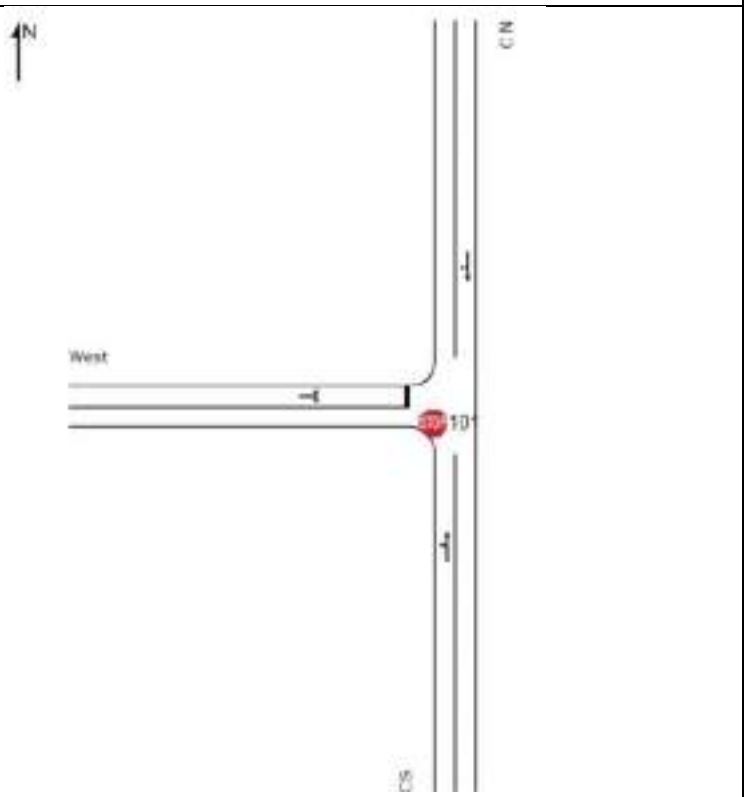
AM Peak: Intersection 3	AM Peak: Intersection 3 Layout
	
Notes: The proposed layout results in an acceptable LOS A.	

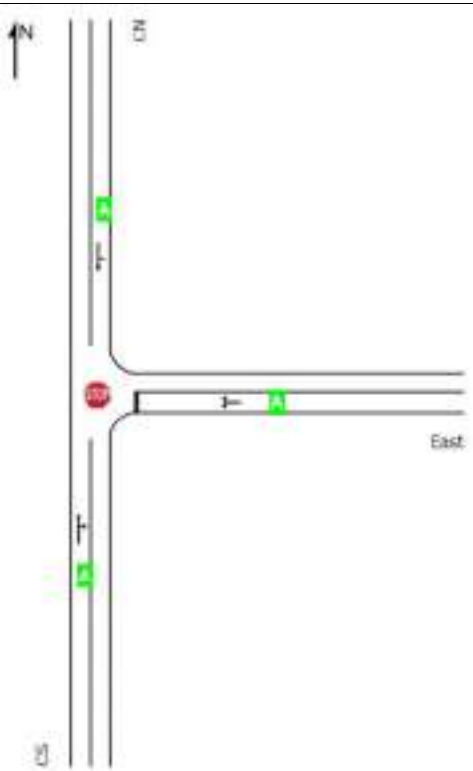
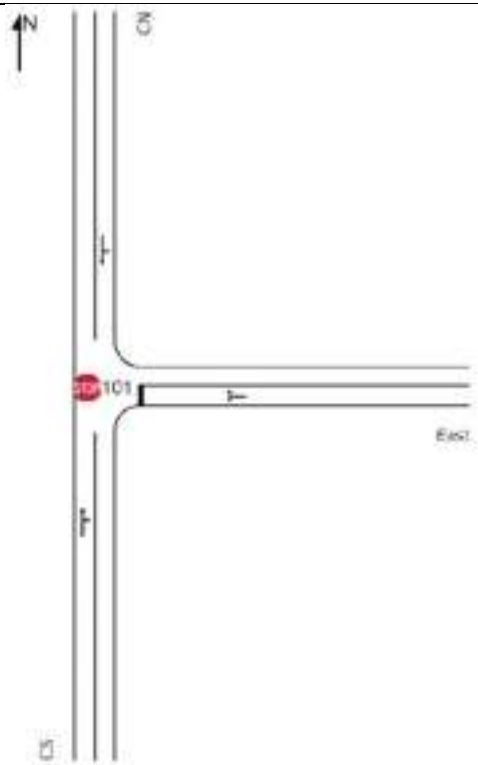
6.3 Collector West Access and internal intersections

This road has one major access to the development and 3 internal intersections. The intersections were all satisfied as priority controlled stop streets.

AM Peak: Access	AM Peak: Access Layout
	
Notes: The proposed layout results in an acceptable LOS A.	

AM Peak: Intersection 1	AM Peak: Intersection 1 Layout
	
Notes: There is a large right turn movement from the east. However, the movements still functions with an acceptable LOS D and an average queue length under 4 vehicles per hour.	

AM Peak: Intersection 2	AM Peak: Intersection 2 Layout
	
Notes: The proposed layout results in an acceptable LOS A.	

AM Peak: Intersection 3	AM Peak: Intersection 3 Layout
	
Notes: The proposed layout results in an acceptable LOS A.	

6.4 Dewetsdorp Intersection

Although the Dewetsdorp intersection is not an access to the development, with the old ring road being relocated to a new location, this intersection essentially becomes an access between the east of Mangaung and the development. Thus it was assessed as the fourth access to the development of for this report.

AM Peak:	AM Peak: Layout
	
Notes: The intersection requires an additional south bound right turn lane, an east bound slip lane and a northern auxiliary exit lane. The intersection still functions acceptably as a priority controlled stop street.	

7. PROPOSED UPGRADES

The traffic impact of both latent rights and the proposed developments is quantified in this report and appropriate recommendations to mitigate are outlined in this chapter.

7.1 Base Year Upgrades (Road Authority Upgrades)

(a) Kolbe Avenue & Nico van der Merwe Avenue

A SMEC designed solution discarding all right turns at this intersection is proposed. This proposal is shown in Appendix G.

(b) Ferreira Road & Helpmekaar Street

A traffic Signal is proposed.

(c) Ferreira Road & Burger Crescent

A traffic Signal is proposed.

(d) Ferreira Road & Vereeniging Interchange

A grade separated interchange to be implemented in near future will help resolve short comings at this intersection. The proposed interchange is shown in Appendix H.

(e) Dr Belcher & Hamilton Road

A SMEC designed solution of a grade separated intersection encompassing a roundabout is proposed. The proposed solution is shown Appendix I.

7.2 2022 Year + latent Rights

(a) President Boshoff Street & St Georges Street

A short additional right turn lane is proposed on the east approach to improve capacity operations at this intersection.

(b) Kolbe Avenue & President Avenue

Additional through lane on the west approach, a third short right turn lane on the east approach and a short additional through lane on the north approach are proposed.

(c) Curie Avenue & Sannaspos Road

Additional through lane is proposed on the north approach.

(d) Curie Avenue & General de la Rey

Additional through lanes on both the north and south approaches are proposed.

(e) N1 & Curie Avenue (North Terminal)

A short 60m slip lane is proposed on the west approach

(f) Harvey Road & Hanger & Fort Street

A shared through and left turn lane is proposed on the north approach. This is a paint marking change.

(g) Ferreira Road & General Brand Drive

A short 60m additional left turn lane is proposed on the west approach is proposed.

(h) OR Tambo & Vooruitsig Street

A third additional through southbound lane is proposed.

(i) OR Tambo & De Waal Road

A traffic signal coupled with a third additional through southbound lane is proposed at this intersection.

(j) OR Tambo & Gutsche Street

A traffic signal coupled with a third additional through southbound lane is proposed at this intersection.

(k) OR Tambo & Hartley

A traffic signal coupled with a third additional through southbound lane is proposed at this intersection.

(l) OR Tambo & Tannery Street

A traffic signal coupled with a third additional through southbound lane is proposed at this intersection.

(m) OR Tambo & M10

A switching grade separated interchange (Koek Sister Interchange) is proposed. The proposed solution is shown in Appendix K.

(n) M10 & Dr Belcher

Short 60m additional through lanes are proposed on the east and west approaches.

7.3 2032 Year + latent Rights

(a) Curie Avenue & Pasteur Avenue

Additional third through lane is proposed on the south approach.

(b) Curie Avenue & Sannaspos Road

A third additional through lane is proposed on the south approach

(c) Curie Avenue & Vereeniging Drive

A third additional right turn lane is proposed on the east approach.

(d) N1 & Curie Avenue (North Terminal)

A second additional right turn lane is proposed on the west approach.

(e) N1 & Curie Avenue (South Terminal)

An exclusive short left turn lane is proposed on the east approach.

(f) Ferreira Road & Generaal Brand Drive

An additional through lane is proposed on the south approach and an exit lane on the north approach. Convert centre lane from left to right turn, this is a paint change.

(g) OR Tambo & Vooruitsig Street

A third additional through northbound lane is proposed.

(h) OR Tambo & De Waal Road

A third additional through northbound lane is proposed.

(i) OR Tambo & Gutsche Street

A third additional through northbound lane is proposed.

(j) OR Tambo & Hartley

A third additional through northbound lane is proposed.

(k) OR Tambo & Tannery Street

A third additional through northbound lane is proposed.

In summary, third additional northbound and south bound lanes are proposed along Currie Avenue from President Boshoff to Vereeniging Drive. The same upgrade is proposed along OR Tambo Avenue from Vooruitsig Street to Taelo Molosioa Street south of Hillside View Access 2.

7.4 2022 Year + Latent Rights + Klipfontein Development

The proposed improvements within the report focus on the major affected intersections that require additional improvements due to the proposed development. This sections discussed the requirements of the external network as detailed in chapter 3 that require additionally improvements to accommodate the developments trips as to the measures put in place in chapter 7.2 above to accommodate the other latent right developments.. The major improvements for the 2022 intersections were the:

- Addition of a new signalised intersection of the Singonzo St/ Taelo Molosioa St intersections.
- The third right turn lane at the Taelo Molosioa St/ OR Tambo Rd
- An additional north bound through lane from the Taelo Molosioa St/ OR Tambo intersection through to the Vooruitsig St/ OR Tambo intersections

- Signalisation of the Singonzo St/ M10 intersection

7.5 2032 Year + Latent Rights + Klipfontein Development

The proposed improvements within the report focus on the major affected intersections that require improvements due to the proposed developments. This sections discussed the requirements of the external network as detailed in chapter 3 that require additionally improvements to accommodate the developments trips as to the measures put in place in chapter 7.3 above to accommodate the other latent right developments. The analysis indicated that the proposed improvements required for the 2032 latent demand will be sufficient to accommodate the trips generated and distributed from the Klipfontein development. However, the major additional requirement is the additional through movement lanes on the proposed Singonzo St/ Taelo Molosioa St intersection.

7.6 Internal Road network:

The proposed accesses and the internal road network intersections require the proposed geometric designs as per the layouts shown in chapter 6. The proposed accesses at the proposed collectors can function acceptably as priority controlled intersections. The access to the development on the proposed arterial must be signalised to accommodate the traffic demand of the development.

The internal intersections on the proposed collectors can operate acceptably as priority controlled intersections as shown in chapter 6. The intersections along the arterial inside the development can function acceptably as priority controlled stop streets with the exception of the second intersection (Proposed Arterial/ Combined School). This intersection must be designed as a signalised intersection.

The proposed collectors are required as single carriageway roads with NMT and Public transport bays present. The proposed arterial is proposed as a dual carriageway. The old outer ring road single carriageway can accommodate the assigned trips.

7.7 New Roads to be constructed

The proposed new roads to be constructed are the proposed arterials that links from the development to the Taelo Molosioa St and the proposed new collectors that access the old outer ring road. The existing Singonzo St will need to be upgraded to arterial standards. The arterial from inside the development to Taelo Molosioa road will need to be a dual carriageway. Two collectors will be required within the developments. These are required as single carriageways. The old ring road can remain a single carriageway with the proposed intersection upgardes as per chapter 6 at the accesses and at the Dewetsdorp Rd. All the internal local roads should be constructed as class U5b roads.

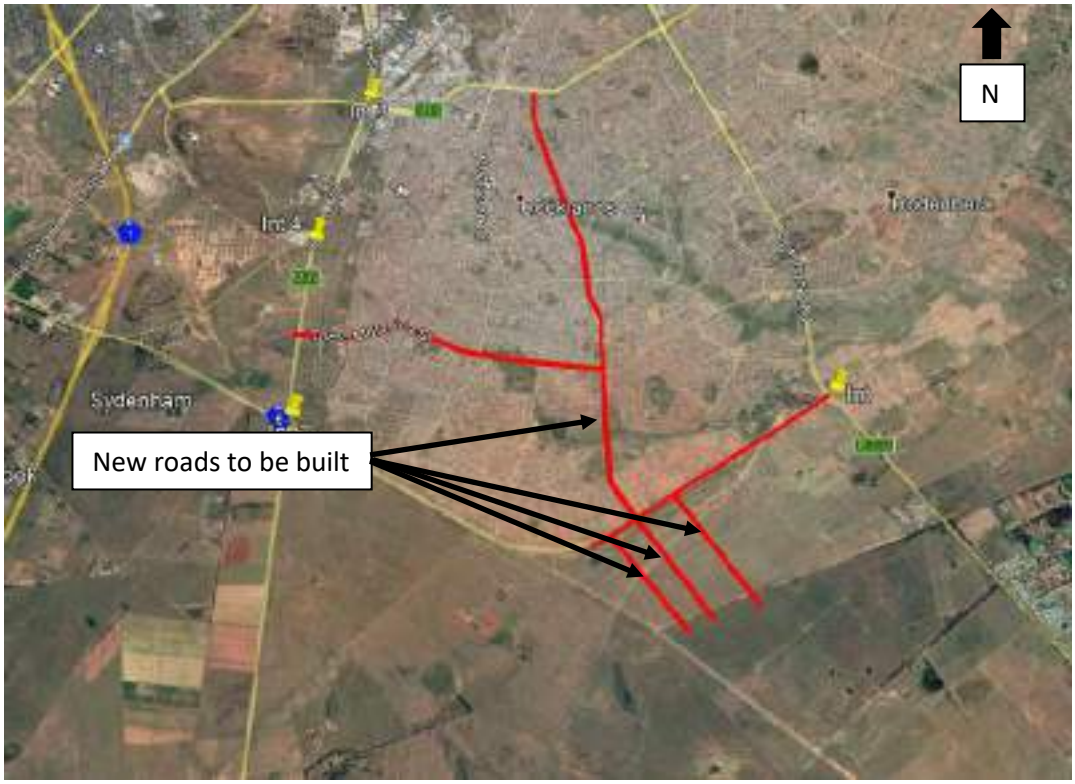


Figure 2: Additional roads added to the model

8. NON-MOTORISED TRANSPORT AND PUBLIC TRANSPORT

The usage of non-motorised transport (NMT) (such as cycling and walking) and public transport are both prominent modes of transport in South Africa and need to be considered when creating an attractive and safe transport system. This is even more important for the Klipfontein development as it will be a low- cost housing development.

8.1 Public Transport

In terms of the National Land Transport Act (Act 5 of 2009), it is required that an assessment on the public transport be included in a traffic impact assessment. The maximum walking distances that commuters are willing to travel on foot to reach public transport services are 400m – 500m in urban areas and approximately 2km in rural areas.

Being surrounded by places of residence, public transport lay-bys are necessary to ensure the commuters have safe and easy public transport access within reasonable walking distance. The roads surrounding the development should be provided with public transport stopping facilities.

Along the arterial and existing road, intersection spacing is lower and there is considerable cross-traffic and pedestrians. Lay-bys are warranted in order to reduce the delay and danger experienced by the road-users. Collectors penetrate neighbourhoods and are therefore the appropriate hierarchy upon which public transport services, particularly feeder services, should be also be provided. (Settlement Planning and Design, V1. 2005)

Because longer widths tend to encourage higher speeds, the recommended minimum width of the lay-bys is 7.3m. The facilities are described below and shown in Figure 8-1, applied to the Klipfontein Development. (As either buses or taxis will operate along these routes all lay-bys should be designed to accommodate the articulated buses of Interstate Bus Lines. These lay-bys would then be able to accommodate at least two mini-bus taxis at the same time.

Collector & Arterial Roads

- The approximate road length being 1km or each road, 2 lay-by facilities can be accommodated along the road at the internal intersections.
- With facilities on both sides of the road, the distance between them should not exceed 800m.
- Lay-by facilities should be located at the main arterial intersection access.

School facilities

- The development houses 3 educational facilities that would require a lay-by facility in the vicinity of each of the developments.

- Shown in the image, the collection and drop-off facilities play a significant role in maintaining a safe environment for learners.

The location of the proposed lay-by facilities are shown below.

Figure 8-1: Lay-by facilities

8.2 Non-Motorised Transport

Non-Motorised Transport (NMT), which includes walking, cycling and wheelchair travel, is a fundamental mode of transport. NMT plays an important role in the first and last kilometer of travel, especially where commuters use public transport. It is important that walkways are provided to link community members to public transport facilities.

The implementation of NMT involves the application of universal access design. Universal access can be defined as the goal of enabling all citizens to reach every destination and it is not limited to access by persons with automobiles. Travel by means of bicycle, walking, or wheelchair to every destination should be accommodated in order to achieve transportation equity, maximize independence and improve community liveability. Universal access ensures that NMT facilities, such as sidewalks are accessible to all, including disabled and wheelchair bound pedestrians.

The following principles need to be considered during planning in order to create a more attractive, safe and user friendly NMT environment:

- Accommodation of all users by ensuring that everyone can access the system safely and conveniently, regardless of mode, age or ability;
- Promotion of community vitality through infrastructural improvements that attract private investment and encourage NMT activity;
- Promotion of active living by providing safe and attractive conditions for walking and cycling; and
- Promotion of the use of public transport modes by improving the efficiency of public transport systems and creating safe, attractive walking environments.

During the development of an NMT friendly environment, the following aspects need to be considered as design elements:

- Universal Access;
- Sidewalks;
- Kerb ramps;
- Mid-block pedestrian crossings;
- Refuge islands;
- Bollards;
- Street lighting at public transport pick up points; and
- Raised intersections as a traffic calming measure.

Using the guidelines provided by the (DOT: NMT Guidelines, 2014, p. 59), the NMT facilities along collector roads will be considered. The recommended pavement side walk width, along the Collector Roads, is a minimum of 1.5m. It is therefore proposed that pedestrian walkways be provided, on both sides of the roadway, in the design of the Klipfontien Development collectors considering the pedestrians that will be utilising the public transport facilities. It is furthermore recommended that pedestrian walkways be provided on both sides of the roadways along the proposed minor arterial and along the old section of the ring road. The walkways proposed below are required to promote NMT, as well as to allow for an improved connectivity. The proposed NMT allows for safe movement of pedestrians within Klipfontein on the higher order roads, as well as allows for NMT to business, schools, churches and other community facilities such as clinics. The design criteria is shown in Figure 8-2 and Table 8-1.

Figure 8-2: Proposed Walkways

Table 8-1: Proposed design criteria for walkways and cycle ways

Road Class	Accepted Minimum Sidewalk Width	Optimal Sidewalk Width (subject to capacity requirements)	Separation Requirements from Motor Vehicle Roadway	Notes
Class 1- Principle Arterials	N/A	N/A	N/A	NMT Facilities are not recommended along these routes
Class 2- Major Arterial	1.5m (check sight distances)	2m (check sight distances)	5m Total Separation	Barriers recommended
Class 3- Minor Arterial	1.5m (check sight distances)	2.5m (check sight distances)	Partial Separation	Dropped kerbs at crossings

Class 4- Collector Street	1.5m	1.8m	Marked Separation	
Class 5- Local Street	1.5m	1.8m	Partial Separation/ Mixed Shoulder	
Class 6- NMT Only	0m	1.5m	No separation required	Walkway and cycleway can be adjacent to minimise earthwork

9. CONCLUSIONS AND RECOMMENDATIONS

The analysis of the development was done in two sections: The internal network and the accesses and secondly the effect the development has on the wider southern Mangaung road network.

9.1 Access and internal road network

The accesses and internal road network was assessed based on the road hierarchy, capacity, NMT and public transport requirements.

Accesses:

There are three access proposed as well as the improvements to the Dewetsdorp Rd intersection. The accesses are located on the proposed arterial and two proposed collectors. The access on the proposed arterial is to be a signalised intersection, while the arterial itself is proposed to be a dual carriageway. The accesses on the collectors are sufficient as stop streets as per the layouts shown in chapter 5. The Dewestsdorp Rd/ Old ring road requires an additional 120m auxiliary lane and an additional 60m right turn lane. It is recommended that these improvements are made.

Internal intersections:

There are nine major internal intersections. Three on the arterial, thee on the western collector and three on the eastern collector. All three of the intersections along the proposed single carriageway collectors are sufficient as stop streets with the proposed layouts as per chapter 6, while two of the intersections along the dual carriageway arterial are also sufficient as stop streets. However, intersection 2 along the arterial is proposed as a signalised intersection. This intersection is also the main access to the proposed combined school and as such formal NMT must be combined with the signalised intersection.

NMT:

It is proposed that the pedestrian walkways be provided, on both sides of the roadway, in the design of the Klipfontien Development collectors considering the pedestrians that will be utilising the public transport facilities. It is furthermore recommended that pedestrian walkways be provided on both sides of the roadways along the proposed minor arterial and along the old section of the ring road. The walkways proposed for the local roads are required to promote NMT, as well as to allow for an improved connectivity. The proposed NMT allows for safe movement of pedestrians within Klipfontein on the higher order roads, as well as allows for NMT to business, schools, churches and other community facilities such as clinics. It is recommended that the proposed NMT as per chapter 8 be designed and implemented.

Public Transport:

Public transport layby are required along the collectors and arterials within the development. In addition, the three schools also require laybys.

Collector & Arterial Roads

- The approximate road length being 1km, 2 lay-by facilities can be accommodated along the road. The facilities should be located at the main arterial access, and at two of the major intersections along both the collectors and the arterial as indicated in chapter 8.
- With facilities on both sides of the road, the distance between them is not more than 800m.

School facilities

- The development houses 3 educational facilities that would require a lay-by facility in the vicinity of each.
- Shown in chapter 8, the collection and drop-off facilities play a significant role in maintaining a safe environment for learners.

It is recommended that the PT facilities be designed as per the locations indicated in chapter 8.

9.2 External Road network

The external road network is significantly affected by many latent developments trips that have an effect through the southern area of Mangaung. As a result, the required improvements needs to achieved an acceptable network excluding the Klipfontein development was highlighted in chapter 5 and 7 and is recommended that those improvements are still implemented throughout the network.

Yet, the major roads and intersections that were identified to be directly affected by the proposed Klipfontein development are:

- Dewetsdorp Rd
    - R702/ Old Ring Rd
- Singonzo St
    - Singonzo St/ M10
    - Singinzo St/ Taelo Molosioa
- Taelo Molosioa St
    - Taelo Molosioa/ OR Tambo Rd
- OR Tambo Rd

- OR Tambo Rd/ M10
- OR Tambo Rd/ Gutsche St
- OR Tambo Rd/ Dewaal Rd
- OR Tambo/ Hartley St
- OR Tambo/ Vooruitsig St
- OR Tambo/ Harvey St

- Dr Belcher Rd
  - Dr Belcher Rd/ Anna Maggerman Crecent
  - Dr Belcher Rd/ Heatherdale Rd
  - Dr Belcher Rd/ M10
  - Dr Belcher Rd/ Monapi St
- M10
  - M10/ Singonzo St
  - M10/ Moshoeshoe St
  - M10/ OR Tambo Rd

As could be seen from the results of the SATURN and SIDRA analysis, the additional improvements required for the above intersections to accommodate the proposed developments trips and latent rights trips are discussed in chapter 5 and 7. It is recommended that the intersections be improved to accommodate the generated traffic from the klipfontein development through into the existing road network as per the phased implementation approach of the latent right developments from between 2022 and 2032.

APPENDIX A – BASE YEAR CALIBRATION GOODNESS OF FIT GRAPH

APPENDIX B – TRIP GENERATION: TECHNICAL NOTE

APPENDIX C – BASE YEAR CAPACITY ANALYSIS RESULTS AND LINK FLOWS

APPENDIX D – MID TERM 2022 AND 2032 + LATENT RIGHTS ONLY CAPACITY ANALYSIS AND LINK FLOWS

APPENDIX E – MID-TERM 2022 + LATENT RIGHTS + DEVELOPMENTS CAPACITY MOVEMENT SUMMARIES

APPENDIX F – MID-TERM 2032 + LATENT RIGHTS + DEVELOPMENTS CAPACITY MOVEMENT SUMMARIES

APPENDIX G – NICO VN DER MERWE AVENUE SOLUTION

APPENDIX H – VEREENIGING DRIVE AND FERREIRA ROAD SOLUTION

APPENDIX I – HAMILTON ROAD AND DR BELCHER ROAD

APPENDIX J – ONE WAY PAIR SOLUTION

APPENDIX K – SWITCHING INTERCHANGE

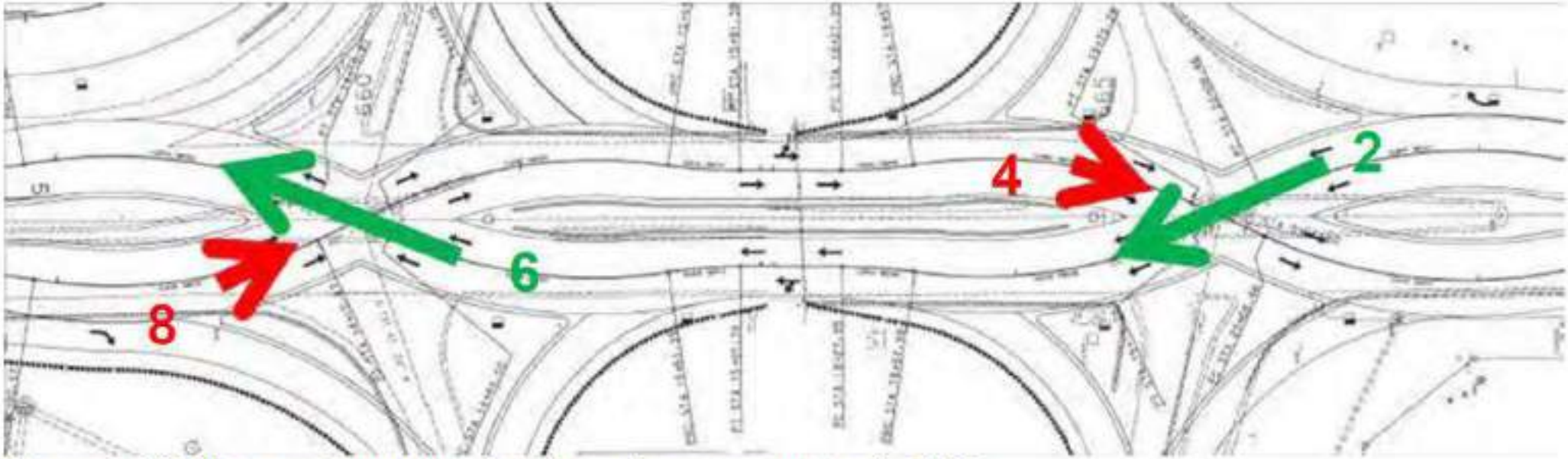


Figure 2.10 Phase assignments for through movements of a DDI

Figure 2.12 Example of sidewalks on the outside

APPENDIX E: PUBLIC PARTICIPATION

APPENDIX E1 NEWSPAPER ADVERT

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Legendariese wiele onder hamer

Veteraanmotors nou te kry

Die veilingshuis Stephan Welz & Co, wat bekend is om sy kundigheid in kuns, juweliersware en meubels, bring dié naweek 'n opwindende versameling van klassieke en veteraanmotors na die veilingsvloer.

Dié veiling, wat as een van die hoogtepunte op die jaar se klassiekemotorkalender bestempel word, sluit in motors wat jare lank in private versamelings was.

Meer as 40 lotte met motors en motorgedenkwaardighede, onder meer emaljetekens wat van die 1920's dateer, asook 'n kinderpedaalmotor van die 1950's, word môre by die Killarney Country Club onder die hamer verkoop. Die veiling met sy skatkis van skaarshede wat 'n verskeidenheid van smake en begrotings sal pas, beloof om die belangstelling van 'n wye spektrum entoesiaste, versamelaars en beleggers te lok.

"Die klassiekemotorveilingsbedryf is wêreldwyd 'n multimiljoendollar-bedryf en word met valkoë uit 'n magdom bedrywe gemonitor, en dus is veilings geneig om die markwaarde van die motors op te stoot," sê Steffan Liebenberg, spesialismotorkonsultant by Stephan Welz & Co.

Hy sê klassieke motors is een van die snelgroeiendste beleggingsklasse ter wêreld. "Dit is 'n belegging wat geniet kan word en die voordeel is dat die tipe motors nie meer gemaak word nie, wat daarop neerkom dat beleggers behoorlik skarrel vir die bates."

Hy sê vanuit 'n Suid-Afrikaanse perspektief is eiendom tans 'n moeilike beleggingskategorie en min mense kan 'n bate wat nie presteer nie, bekostig. " 'n Klassieke motor het internasionale waarde en kan saam verhuis."

Van die hoogtepunte is 'n 1936 Derby Bentley met vier deure wat skaarser as hoendertande is.

'n Fiat 15 pk. Torpedo van 1911, die oudste Fiat in die land wat nog kan ry, is ook te kry. Die motor kom saam met 'n argief van dokumente wat sy herkoms bevestig. Dit sluit in die oorspronklike verkoopstrokie gedateer 9 Augustus 1911 wat aandui dat die motor tóé vir die koninklike som van £500 verkoop is.

'n Rooi Ferrari 308 GTSi van 1981, soortgelyk aan die een waarmee Tom Selleck in *Magnum P.I.* rondgerits het, gaan die koppe laat draai.

Daar is ook klassieke motors aan die laer kant van die prysskaal, soos 'n gerestoureerde Mercedes 2205 Ponton.

Inligting is te kry by www.stephanwelzandco.co.za of volg die veilingshuis op Instagram en Facebook.

Dié 1936 Derby Bentley met vier deure wat skaarser as hoendertande is, is die naweek by Stephan Welz & Co se veiling beskikbaar. Dié veteraanmotor het 'n voorveilingsberaming van tussen R850 000 en R950 000.

'n Fiat 15 pk. Torpedo (1911), die oudste Fiat in die land wat nog kan ry.

Wenke vir nuwelingbeleggers

■ Doen jou huiswerk voor jy koop. Dit is belangrik om te weet of die onderdele beskikbaar is en waar om die voertuig te laat diens.

■ Begin deur iets "veiligs" te koop, verkieslik 'n klassieke motor wat nie 'n nisbelegging is nie en een wat almal graag wil besit. Só kan jy die motor verkoop en jou geld terugkry as jy agterkom dat dit nie die regte wiele vir jou is nie.

■ Die bateklas is soortgelyk aan die kunsmark en nie almal hou van dieselfde items nie. Vanweë sentiment is daar kopers wat bereid is om meer as die markprys te betaal. 'n Praktiese reël is dat dit beter is om vir beleggingsdoeleindes eerder in 'n skaars voertuig, waarvan daar minder gemaak is, te belê. Dié tipe motors is gewoonlik op almal se wenslysies.

■ Wees geduldig omdat dit 'n bateklas is wat oor tyd in waarde toeneem.

■ Verstaan die geskiedenis van die motor en dit wat dit spesiaal maak.

Bo: Dié bloedrooi Ferrari 308 GTSi van 1981, soortgelyk aan die een waarmee Tom Selleck in *Magnum P.I.* rondgerits het, gaan die koppe laat draai.

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KENNISGEWINGS

NOTICE OF ENVIRONMENTAL IMPACT ASSESSMENT (SCOPING PROCESS) FOR THE PROPOSED TOWNSHIP ESTABLISHMENT DEVELOPMENT, WITHIN MANGAUNG METROPOLITAN MUNICIPALITY, BLOEMFONTEIN, FREE STATE PROVINCE

Notice is hereby given in terms of Regulation published in Government notice GNR 327, 324, and 325 Amended on the 7th of April 2017 published in terms of Chapter 5 of the National Environmental Management Act (Act no. 107 of 1998) and the EIA Regulations of the intent to conduct an Environmental Impact Assessment study for the project outlined in this advert.

NATURE OF ACTIVITY
The proposed project is the development of a mixed-use township establishment covering an area of 214.1 Hectares, within the jurisdiction of Mangaung Metropolitan Municipality. The mixed used township establishment will entail of the following: Residential; Institutional Facilities (police station, health centre, library, community centres); Recreational facilities; Educational facilities; Place of worship; Business sites; Public open spaces; and Municipal facilities.

The proposed project constitutes of activities listed under National Environmental Management Act 107 of 1998 as amended on 07 April 2017 which are: Activity 9, Activity 10, Activity 11, Activity 15, and Activity 24 of Notice 1 GNR 327.The activity listed require an Environmental Impact Assessment to be undertaken by an Independent Environmental Assessment Practitioner for the Environmental Authorisation.

PROPERTY DESCRIPTION
The proposed development is located at Mangaung situated at a land described as portion of farm Klipfontein 716 farm Ceres 626 within Mangaung Metropolitan Municipality, Bloemfontein, Free State Province.

GPS: **26o15'48.176"E 29o12'51.064"S**

NAME OF APPLICANT
Mangaung Metropolitan Municipality

NAME OF ENVIRONMENTAL ASSESSMENT PRACTITIONER
Inaluk Consulting Services

REGISTRATION OF INTERESTED AND AFFECTED PARTIES
This Notice serves to invite all Interested and or Affected Parties on the project to kindly register as stakeholders to the proposed project so as to have an opportunity to correspond with the project team on project activities. In order to register as Interested and Affected Parties you can contact us by telephone or e-mail within 30 days of this notice. Or alternatively attend the meeting that will be held on the 30th of November 2019 at 10h00 am on site.

REGISTRATION, QUERIES OR WRITTEN COMMENTS SHOULD BE SUBMITTED TO:
Contact Person:
Kulani Nkuna
Tel: 072 783 4002,
Email: kulani@inaluk.co.za
Address: 29 Tulana; Jozini Street;
Moreleta Park; Pretoria, Gauteng, 0181

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VEILINGS

I-PROP AFSLAERS bied 'n **VEILING** aan namens FHS MEIRING van twee SAAI- EN VEE PLASE in die BULTFONTEIN omgewing

DINSDAG, 3 DESEMBER 2019 om 11H00 by die GRASDAK te Bulfontein se skougronde

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EIENDOM 2 Gedeelte 1 van die plaas, Hammesfontein, Nr 147. GROOT 116.3506 Hektaar WATER 1x Boorgat LAND EN VELD 116.3506 Hektaar Land KRAG Eskom, 1x Transformer

EIENDOM 3 Gedeelte 1 van die plaas, Izaaks Laagte, Nr 278. GROOT 116.3506 Hektaar WATER 1x Boorgat met 'n windpomp. 1x Sement dam LAND EN VELD 116.3506 Hektaar Land. KRAG Eskom

EIENDOM 4 Gedeelte 2 van die plaas, Izaaks Laagte, Nr 278 GROOT 85.6532 Hektaar WATER 1x Boorgat met 'n windpomp. LAND EN VELD 85.6532 Hektaar Land.

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Jurgens sleepwa
Tosher Kamp wa
Koppies 6 ton wa
En vele meer

Trekker:
Case III
Ford 6600
Landini Global
Ford 4600
Mccormick 110
Case 2388 Stroper
Ford 4600
En vele meer

Plaas implemente:
John Deere 2117 Planter
John Deere 893 6 ry plukkerkop
Case Flexi Tafel 30ft op karetjie
2 x Lisagally Spuite
Bossie kapper
10 m Vetsak Spuit met booms 800 liter
Wilton 8 Skaar ploeg
En vele meer

Lewende Hawe:
25 Koeie met 15 kalwers

26 NOVEMBER 2019 OM 10 VM

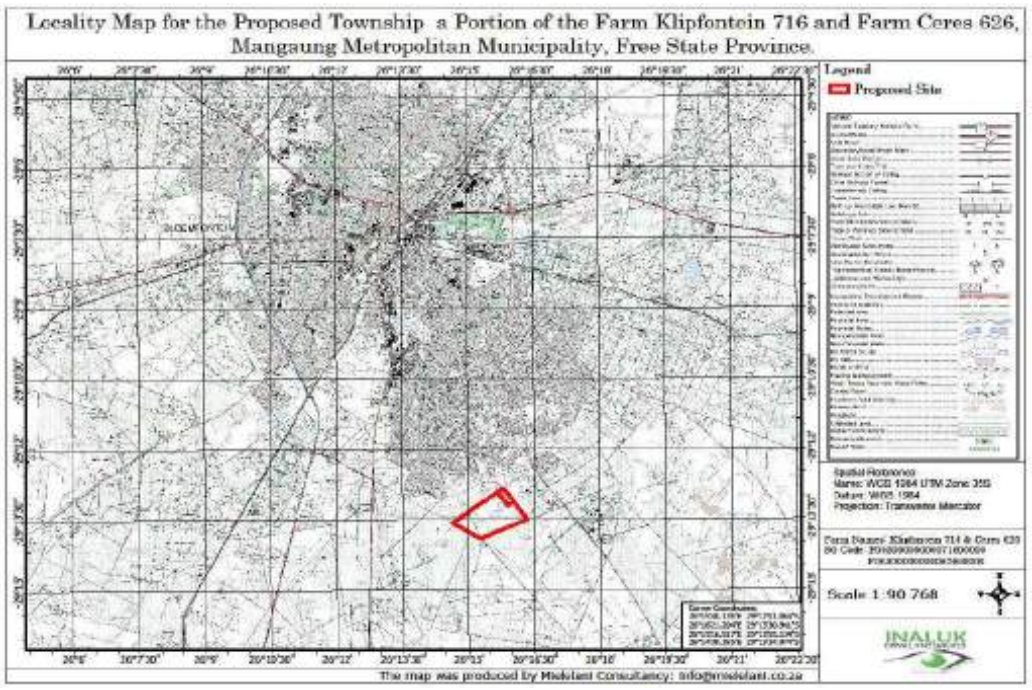
KONTAK: 051 430 2300 • Nico Maree 082 625 4455
• Jan Hugo 082 555 9084 • E-POS: bloem@parkvillage.co.za

VOORWAARDES - LOSBATES:
R10,000.00 terugbetaalbare registrasie deposito betaalbaar. 6% Kopers kommissie plus BTW betaalbaar op vaste eiendom. 15% deposito betaalbaar op die val van die hamer. Vir die balans moet die KOPER 'n goedgekeurde bankwaarborg verskaf binne 30 dae na datum van bekragtiging. 10% Kopers kommissie plus BTW betaalbaar op losgoed. Alslaer. Nico Maree/Jan Hugo. 14 dae bekragtigings periode van toepassing op vaste eiendom en 7 dae bekragtigings periode van toepassing op losgoed. Dokumentasie fooi van R1500.00 plus BTW is betaalbaar op voertuie en R3000.00 plus BTW op Trekkers, Vragmotors en sleepwaens. Alle finansiering moet vooraf klaar gereel wees. FICA vereistes (id & bewys van adres) moet aan voldoen word. Geen transaksie sal afgehandel word sander om aan FICA-vereistes te voldoen nie. Veiling is onderhewig aan reserwe prys. Alle potensiele kopers moet vooraf registreer. Algemene veilings reels beskikbaar op ons webwerf. Die veilings reels is in ooreenstemming met Artikel 45 van die Verbruikersbeskerming Wet, Wet 68 van 2008, wat beskikbaar is op ons webwerf - URL http://www.parkvillageauctions.co.za/wp-content/uploads/2013/10/Rules_of_Auction.pdf **Bg. is onderhewig aan verandering sonder voorafkennisgewing.** 3104

APPENDIX E2 SITE NOTICE

NOTICE OF ENVIRONMENTAL IMPACT ASSESSMENT (SCOPING PROCESS) FOR THE PROPOSED TOWNSHIP ESTABLISHMENT DEVELOPMENT, WITHIN MANGAUNG METROPOLITAN MUNICIPALITY, BLOEMFONTEIN, FREE STATE PROVINCE

Notice is hereby given in terms of Regulation published in Government notice GNR 327, 324, and 325 Amended on the 7th of April 2017 published in terms of Chapter 5 of the National Environmental Management Act (Act no. 107 of 1998) and the EIA Regulations of the intent to conduct an Environmental Impact Assessment study for the project outlined in this advert.



NATURE OF ACTIVITY

The proposed project is the development of a mixed-use township establishment covering an area of 214.1 Hectares, within the jurisdiction of Mangaung Metropolitan Municipality. The mixed used township establishment will entail of the following:

- Residential;
- Institutional Facilities (police station, health centre, library, community centres);
- Recreational facilities;
- Educational facilities;
- Place of worship;
- Business sites;
- Public open spaces; and
- Municipal facilities.

The proposed project constitutes of activities listed under National Environmental Management Act 107 of 1998 as amended on 07 April 2017 which are: **Activity 9, Activity 10, Activity 11, Activity 15, Activity 24** of Notice 1 GNR 327.The activity listed require an Environmental Impact Assessment to be undertaken by an Independent Environmental Assessment Practitioner for the Environmental Authorisation.

PROPERTY DESCRIPTION

The proposed development is located at Mangaung situated at a land described as portion of farm Klipfontein 716 farm Ceres 626 within Mangaung Metropolitan Municipality, Bloemfontein, Free State Province.

GPS: **26º15'48.176"E 29º12'51.064"S**

NAME OF APPLICANT

Mangaung Metropolitan Municipality

NAME OF ENVIRONMENTAL ASSESSMENT PRACTITIONER

Inaluk Consulting Services

REGISTRATION OF INTERESTED AND AFFECTED PARTIES

This Notice serves to invite all Interested and or Affected Parties on the project to kindly register as stakeholders to the proposed project so as to have an opportunity to correspond with the project team on project activities. In order to register as Interested and Affected Parties you can contact us by telephone or e-mail within 30 days of this notice. Or alternatively attend the meeting that will be held on the **30th of November 2019** at **10h00** am on site.

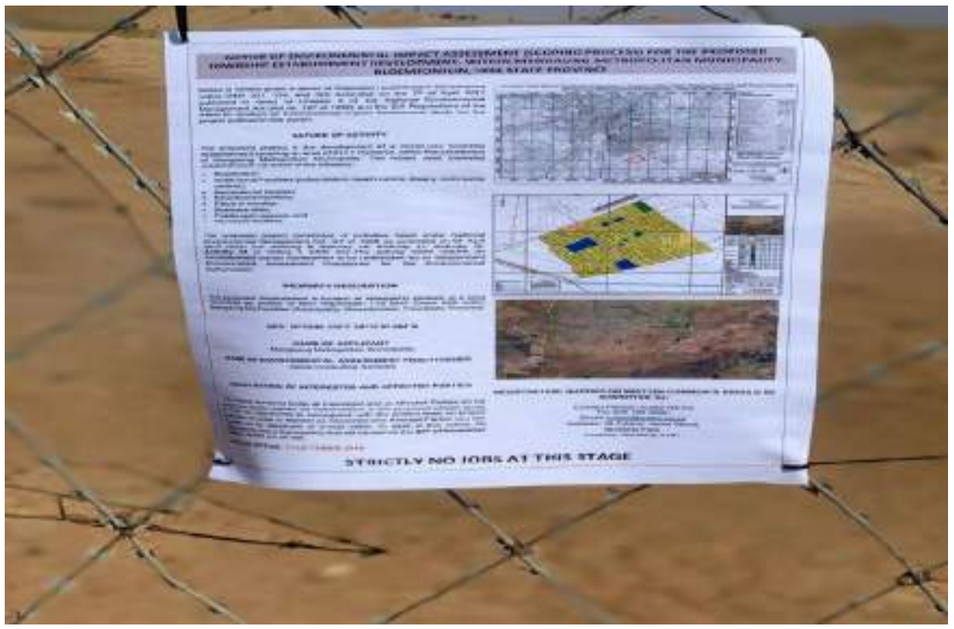
DATE OF NOTICE: 17 OCTOBER 2019

REGISTRATION, QUERIES OR WRITTEN COMMENTS SHOULD BE SUBMITTED TO:

Contact Person: Kulani Nkuna
Tel: 072 783 4002,
Email: kulani@inaluk.co.za
Address: 29 Tulana; Jozini Street;
Moreleta Park;
Pretoria, Gauteng, 0181

STRICTLY NO JOBS AT THIS STAGE

SITE NOTICE PHOTOGRAPHS



BACKGROUND INFORMATION DOCUMENT

INALUK
CONSULTING SERVICES

BACKGROUND INFORMATION DOCUMENT (BID)

FOR THE PROPOSED TOWNSHIP ESTABLISHMENT AT PROPERTY DESCRIBED AS PORTION OF FARM KLIPFONTEIN 716, AND FARM CERES 626 WITHIN MANGAUNG METROPOLITAN MUNICIPALITY, BLOEMFONTEIN, FREE STATE PROVINCE.

DESTEA REFERENCE

1) INTRODUCTION

Inaluk consulting services was appointed by Ngoti Development consultant's ton behalf of the Mangaung Metropolitan Municipality (Applicant) to conduct the EIA for the authorisation of the proposed development.

The application for environmental Authorisation was lodged with the Department of Economic, Small Business Development, Tourism & Environmental Affairs (DESTEA) for consideration.

2) PURPOSE OF THIS DOCUMENT

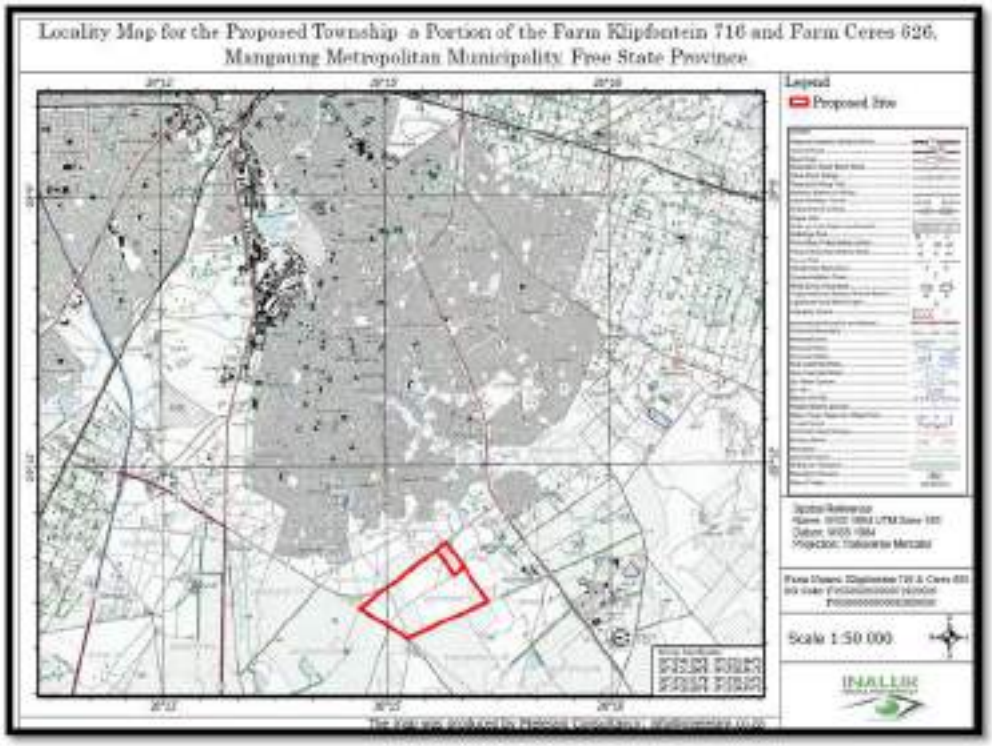
An Environmental Impact Assessment (EIA) process has commenced to assist the Mangaung Metropolitan Municipality (MMM) in determining the extent and significance of the environmental consequences associated with the proposed development on farm Klipfontein 716 and farm Ceres 626, Bloemfontein within the Mangaung Metropolitan Municipality, Free State. Notice is hereby given in terms of Regulation published in Government notice GNR 327, 324, and 325 Amended on the 7th of April 2017 published in terms of Chapter 5 of the National Environmental Management Act (Act no. 107 of 1998) and the EIA Regulations of the intent to conduct an Environmental Impact Assessment study for the project.The purpose of this Background Information Document (BID) is to provide a brief description of the project and EIA process that will be followed, and to obtain initial comments and contributions from Interested and Affected Parties (IAPs) on the issues relating to the proposed development. Findings of the EIA, including concerns raised by IAPs, will be submitted to the Department of Economic, Small Business Development, Tourism & Environmental Affairs (DESTEA) for consideration.

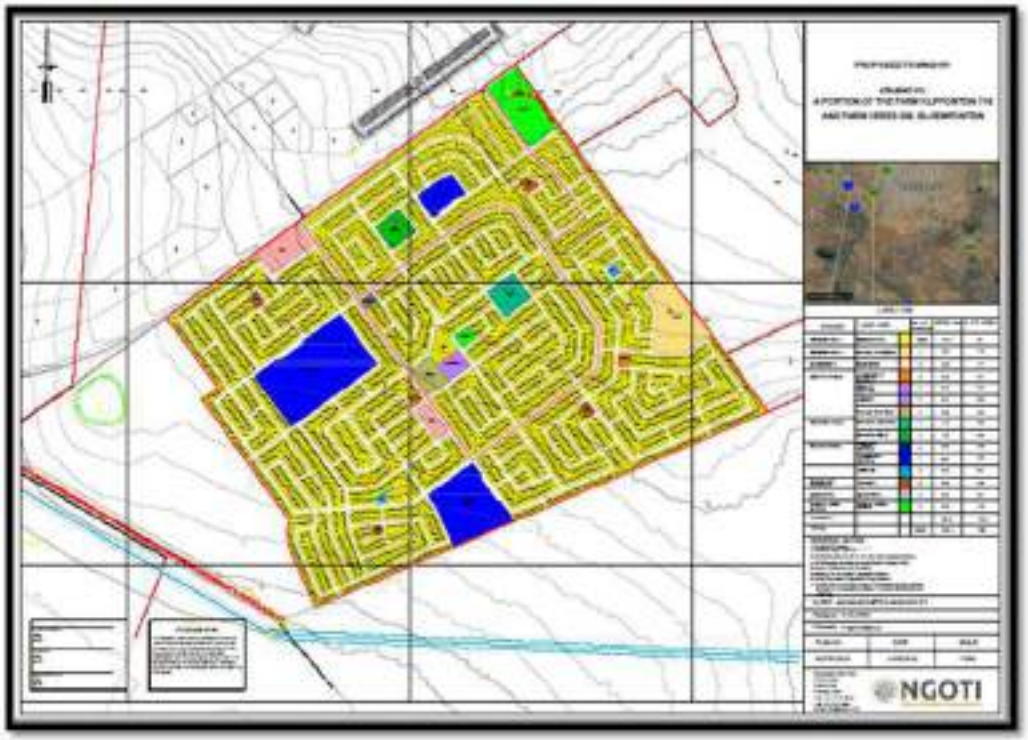
IAPs are hereby invited to comment on the environmental, social and economic issues relating to the proposed Township development. Your comments will ensure that relevant issues are evaluated and will form part of the Assessment. Kindly complete the registration form at the end of this document and send (either via email or post) to Kulani Nkuna at Inaluk Consulting Service, to register your interest in the proposed activity and provide your input.

Your comment on this document must reach Inaluk Consulting Service
Consulting by 15:00 on 30 November 2019
Mrs Kulani Nkuna, Inaluk Consulting Services
Postal address: 29 Tulana, Jozini Street, Moreleta Park, Pretoria, Gauteng, 0181
E-mail: kulani@inaluk.co.za

3) PROJECT LOCATION

The proposed development footprint is located across the road from an already established township area (near Kopanong) and approximately 214,1 ha in surface size, situated within the Mangaung Metropolitan Municipality, Free State Province. The site is situated partly adjacent to Dewetsdorp Road and the M30, approximately 17 km outside Bloemfontein central with the following coordinates: 29° 12' 55.95" S and 26° 15' 51.58" E. The proposed footprint is situated on a Portion of the Farm Klipfontein 716 and Farm Ceres 626.


Locality Map for the Proposed Township a Portion of the Farm Klipfontein 716 and Farm Ceres 626, Mangaung Metropolitan Municipality Free State Province
Legend
Proposed Site
Scale 1:50 000
INALLIK


NGOTI

4) PROJECT SCOPE

The proposed project is the development of mixed-use township establishment covering an area of 214.1 Hectares. The mixed-use township establishment entails of the following:

- Residential
- Institutional facilities (police station ,health centres, library, community centres
- Recreation facilities;
- Educational facilities;
- Place of worship;
- Business sites;
- Public open spaces; and
- Municipal facilities;

5) LEGISLATIVE REQUIREMENTS

The national Environmental Management Act of 1998 in line with the Environmental Impact Assessment Regulations GNR 326 of 2017 will form part of the main legal reference documents in the EIA process for the approval of the site and construction activities.

The EIA Regulations have a list of proposed activities that constitute an EIA to be undertaken. The nature of the project determines whether the developer should prepare a Basic assessment report for developments with low –medium impacts and process or scoping and EIA Report. Projects likely to have significant negative impacts on the environment tend to fall under the scoping and EIA category in Listings Notice 2 of the EIA regulations.

In line with the defined scope of the work the following listed activities are triggered with the proposed development of the township.

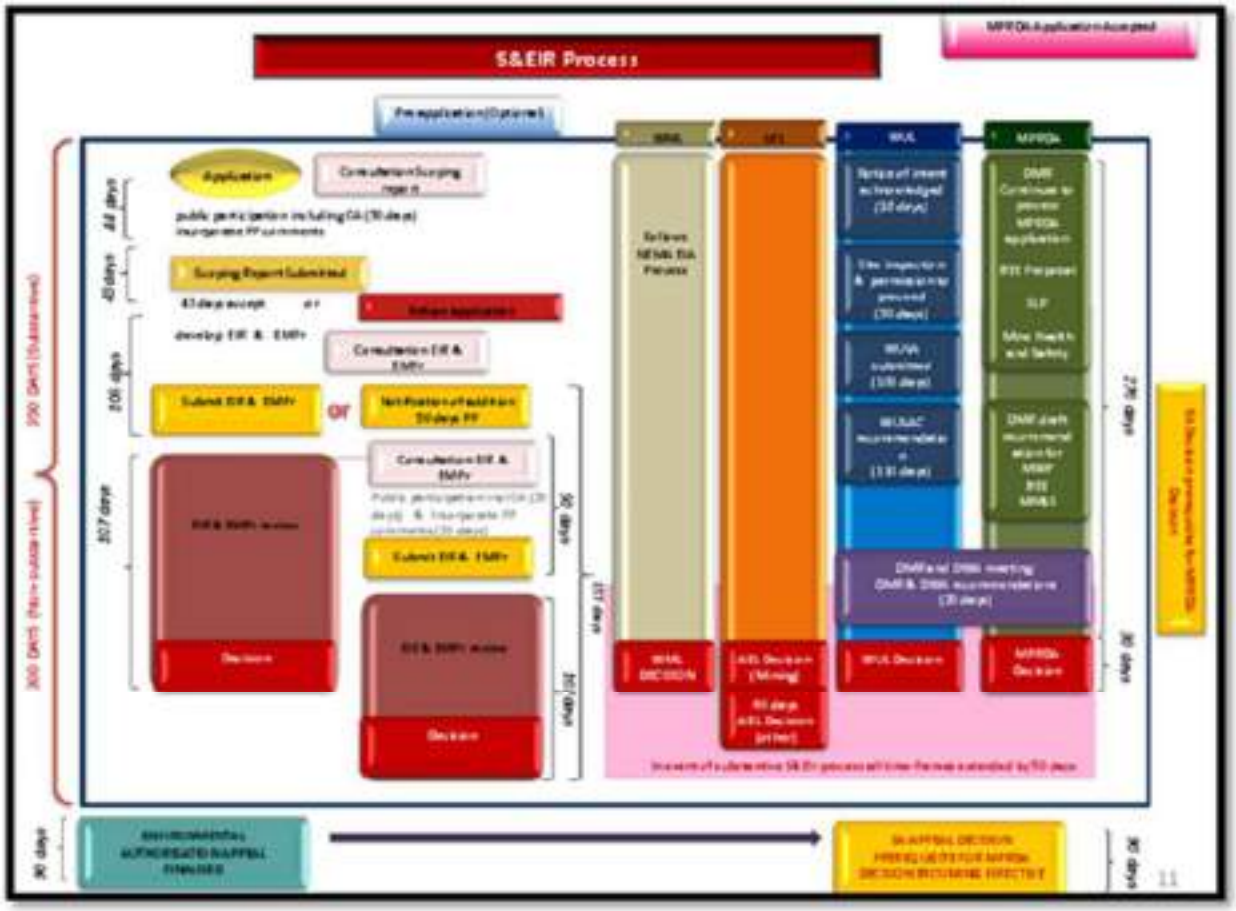
LISTED ACTIVITY	ACTIVITY Number	DETAILS OF THE LISTED ACTIVITY IN LINE WITH PROJECT
GNR 325 of 7 April 2017	Activity 15	The clearance of more than 200 hectares of land for the establishment of the various land uses on 214,1 hectares of land
GNR 327 of 7 April 2017	Activity 9	The development of infrastructure exceeding 1 000 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
GNR 327 of 7 April 2017	Activity 10	The development and related operation of infrastructure exceeding 1 000 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
GNR 327 of 7 April 2017	Activity 11	The development of facilities or infrastructure for the transmission and distribution of electricity— (i) outside urban areas or industrial complexes with a capacity of more than 33 but less than 275 kilovolts; or

6) WHAT IS AN ENVIRONMENTAL IMPACT ASSESSMENT?

An EIA is a planning and decision-making tool that is used to identify the environmental consequences of a proposed project, before the development takes place.

The purpose of the EIA is to demonstrate to the authorities and the proponent what the potential consequences of their choices will be in environmental, economic and social terms. Public issues and concerns must therefore be identified timeously so that these can be evaluated and incorporated into the final design if necessary. The EIA consists of two phases. The first phase is a Scoping Study, which identifies potential issues which need more detailed investigation. The second phase is the EIA phase, where detailed investigations of the issues identified during scoping, are undertaken.

ENVIRONMENTAL IMPACT ASSESSMENT PROCESS



7) PUBLIC PARTICIPATION PROCESS

Public participation is the cornerstone of the Environmental Impact Assessment process. The principles of the National Environmental Management Act (NEMA) govern most aspects of EIAs, including public participation. These include the ongoing provision of sufficient information (in a transparent manner) to Interested and Affected Parties (IAPs).

During the Public Participation Process, input from the proponent, technical experts, government authorities and the general public will be gathered to result in a better understanding of the project for all involved, and more informed decision-making throughout the process.

During the Scoping phase of this project, the key objective of public participation is to provide IAPs with an opportunity to provide comment and input in the planning phase of the project. Issues of concern and suggestions raised by IAPs will be addressed and responded to as required in the Scoping Report, and IAPs will also be given the opportunity to comment on the findings of both the Scoping and EIA Reports and findings of the Specialist studies during the specified comment periods

IAPs will be provided with a 14-day comment period in which to raise issues and / or concerns in response to the Background Information Document. A draft Scoping Report (DSR) will be compiled and will be available for public comment for a period of 30 days, where after the Final Scoping Report (FSR) including Comments and Responses from the public will be submitted to DESTEA. Once we have received confirmation from DESTEA that we may proceed to the Impact Assessment Phase, the Draft Environmental Impact Report (DEIR) will be compiled and be made available for a 30 day comment period. Thereafter the Final Environmental Impact Report (FEIR), together with all comments and responses from the public will be submitted to DESTEA for decision. IAPs will be notified in writing of any decisions made by DESTEA after submission of the FEIR.

Please note that communications regarding the process and the availability of reports will only be sent to register IAPs. To register for the process, and thus receive further communications regarding this development, please register by sending the signed registration sheet at the back of this document, together with your contact details and nature of interest, to Inaluk Consulting Service.

8) POTENTIAL IMPACTS OF THE PROPOSED PROJECT

The following impacts and issues are anticipated during the construction and operation phase of the proposed project:

- Impact on flora and fauna;
- Soil erosion
- Noise pollution
- Surface water pollution
- Dust emissions
- Wetland impacts

9) ALTERNATIVE OPTION FOR THE PROPOSED PROJECT

The proposed project does not have an alternative

10) SPECIALIST STUDIES TO BE CONDUCTED

Due to the nature of the impacts on the receiving environment specialist input have been appointed in order to assist with mitigation measures that can be implemented to reduce the potential impacts on the receiving environment. The below is a list of specialised assessments in progress.

- Traffic Impact Assessment
- Geotechnical Assessment
- Phase 1 Heritage impact assessment
- Ecological Assessment
- Services assessments (Engineering report for services)
- Wetland Assessment

REGISTRATION AND COMMENT SHEET

THE PROPOSED TOWNSHIP ESTABLISHMENT ON A PORTION OF THE FARM KLIPFONTEIN 716 AND FARM CERES 626, BLOOMFOTEIN, FREE STATE PROVINCE.

REPLY SLIP: PLEASE FILL-IN AND RETURN

ATTENTION: KULANI NKUNA

CELL: 072 783 4002 **Email: kulani@inaluk.co.za**

Name and Surname:			
Tittle:			
Organisation / Company:			
Address:			
Tel:	Fax:	Email:	Cell:
Record your comments below:			
Signature:		Date:	

APPENDIX E3 LIST OF REGISTERED I&APS

PUBLIC PARTICIPATION DATABASE REGISTRATIONS

Project Name: Application for environmental authorisation for the proposed township establishment on a portion of the farm Klipfontein 716 and farm Ceres 626, Bloemfontein

Reference Number:

Province: free State

Name and Surname	Organisation	Postal Address	Physical Address	Contact
Client				
Attie Vanheerde	Mangaung Metropolitan Municipality	P O Box 3704 Bloemfontein 9300	Room 915, Bram Fischer Building , Nelson Mandela Drive & Markgraaf Street, Bloemfontein,9301	Tel: 051 405 8911 Email:attie.vanheerden@mangaung.co.za
Local Authority				
Mrs M. Ramongalo	Mangaung Metropolitan Municipality	P O Box 3704 Bloemfontein 9300	Room 1017, 10th floor, Bram Fischer Building , Nelson Mandela Drive & Markgraaf Street, Bloemfontein,9301	Tel: 015 405 8429/ 051 405 8577 Email: Mpolokeng.Ramangalo@mangaung.co.za
Crl Rampai (Chabeli Frank)	Mangaung Metropolitan Municipality –Ward 7 Councillor	P.O Box 3704 Bloemfontein 9300		Tel: 083 5910 512 /063 6993 527 Email: frankrampaifr6@gmail.com
State Department				
Ms. D. Mokoena	Department of economic, small business development, tourism and environmental affairs	Private Bag X 20801 Bloemfontein 9300	Room 19, 3rd Floor, 113 ST Andrews Street, Bloemfontein 9300	Tel: 051 400 4831 Email: mokoena@destea.gov.za
Mr Jack Morton	Department of Agriculture Forestry and Fisheries	Private Bag X01 Glen	Gielie Joubert Street, Glen, Bloemfontein, 9360	Tel:051 861 8369 Cell: 083 302 0703

		9360		Fax: 086 234 6758 Email: jack@fs.agric.za
Mr Chris Smith	Department of Agriculture and Rural Development	Private Bag X01, Glen, Bloemfontein, 9360	Gielie Joubert Street, Glen, Bloemfontein, 9360	Tel: 073 156 2740 Email: csmith@dard.gov.za
Mr C Pietersen	Department of water and sanitation	Private Bag X528 Bloemfontein 9300	Department of Water affairs 2nd floor Sanlam Plaza Building Corner Eastburger & Maitland Street, Bloemfontein, Free State	Tel: 015 405 9000 Email: pietersen@dws.gov.za
Dr Ragna Redelstorf	SAHRA	P.O Box 4637 Cape Town 8001	111 Harrington Street, Cape Town, 8001	Tel: 021 462 4502 Email: rredelstorff@sahra.org.za
Thobile Duma	SANRAL		58 van Eck Place Mkondeni Pietermaritzburg KwaZulu-Natal 3200	Tel: 033 392 8167 / 083 328 0989 Email: dumat@nra.co.za

APPENDIX E4. COMMENTS AND RESPONSES

INALUK
CONSULTING SERVICES

REGISTRATION AND COMMENT SHEET

THE PROPOSED TOWNSHIP ESTABLISHMENT ON A PORTION OF THE FARM KLIPFONTEIN 716 AND FARM CERES 626, BLOEMFOTEIN, FREE STATE PROVINCE.

REPLY SLIP: PLEASE FILL-IN AND RETURN

ATTENTION: KULANI NKUNA

CELL: 072 783 4002 **Email: kulani@inaluk.co.za**

Name and Surname:	CHRIS SMITH		
Title:	MR		
Organisation / Company:	DEPT AGRICULTURE RURAL DEV (DARD)		
Address:	GLEN		
Tel:	Fax:	Email:	Cell:
073 162 3740		CSMITH@DARD.GOV.ZA	

Record your comments below:

According our information there two farms and no agricultural lands and cannot be develop without rezoning

Signature: Date: 28/11/2019

destea
department of
economic, small business development,
tourism and environmental affairs
FREE STATE PROVINCE

Ref Nr: EMS/15/20/01
NEAS Ref Nr: FSP/EIA/0000339/2020
Enquiries: Dimakatso Mokoena
113 ST Andrews Street, Bloemfontein, 9300
051 400 4831 or mokoenad@destea.gov.za

Mrs. Kulani Nkuna
Inaluk Consulting Services
29 Tulana, Jozini Street
Moreleta Park, 0181

Contact No: 072 781 4002 / Email address: kulani@inaluk.co.za

Dear Mrs, Nkuna,

RE: ENVIRONMETAL AUTHORISATION APPLICATION FOR THE PROPOSED CLEARANCE OF INDIGENOUS VEGITATION FOR THE TOWNSHIP ESTABLISHMENT ON PORTION OF FARM KLIPFONTEIN 716 AND CERES 626 IN MANGAUNG METROPOLITAN MUNICIPALITY.

The Department of Economic, Small Business Development, Tourism and Environmental Affairs (DESTEA) - "The Department" has reviewed the draft scoping report and the following should be amended and included in final scoping and Environmental Impact Reports:

1. The Wetland Delineation must be conducted as the recommendations from the Ecological Impact Assessment Report.
2. The Heritage Impact Assessment Report is missing conclusion and recommendations pages.
3. The Engineering Services Report must be conducted and a letter confirming availability of services must be obtained from the Competent Authority.
4. Traffic Impact Assessment must be conducted and approved by relevant Competent Authority.
5. The comments from the South African Heritage Resource Agency must be included.
6. The South African National Road Agency must be included as key stakeholders as the proposed development footprint is on the area where SANRAL planned roads that will form part of the N6 road.

Regards,

Ms. D. Mokoena
Environmental Officer Production Grade A: EIM
Date: 11/06/2020

Sub- Directorate: **Environmental Impact Assessment**
Private Bag X 20601 Tel +27 (0)51 400 4812
Bloemfontein E-mail: mkhosana@destea.gov.za
9300

MANGAUNG
METRO MUNICIPALITY
METRO MUNISIPALITEIT
LEKGOTLA LA MOTSE

DIRECTORATE
PLANNING

Our Ref: EIA/12/2019 Your Ref: Township establishment Klipfontein 716 and Farm Ceres 626

Enquiries: M. Ramongalo Date: 02 December 2019

Inaluk Consulting services

Email: amuckkhosa@gmail.com

PUBLIC PARTICIPATION PROCESS FOR THE PROPOSED TOWNSHIP ESTABLISHMENT ON PORTION OF THE FARM KLIPFONTEIN 716 AND FARM CERES 626. BLOEMFONTEIN.

Reference is made to your letter received by this office regarding the above-mentioned application. This office requests more information concerning the proposed activity on Farm Klipfontein 716 and Farm Ceres 626 in order to give meaningful comments. **A hard copy** of the environmental reports must be submitted to this office for review and comments. In the report to be submitted it must clearly be demonstrated in which way the proposed development will meet the requirement of sustainable development. It must also consider energy efficient technologies and water saving devices and technologies for the proposed development. This could include measures such as recycling of waste, the use of low voltage or compact fluorescent light instead of incandescent globes, management of storm water, the capture and use of rainwater from gutter and roof and the use of locally indigenous vegetation during landscaping and the training of staff to implement good housekeeping technique light pollution, air quality, water use and solid waste management.

Should more information be required, please contact this office

Kind Regards

MRamongalo

Mrs M. Ramongalo
Manager Environmental Assessment
Environmental Management

PO Box 3704, Bloemfontein 9300, Room 1017, 10th floor, Bram Fischer Building, Cnr Nelson Mandela & Markgraaff Street
Tel: +27 51 405 8577; E-Mail: Mpolokeng.Ramongalo@mangaung.co.za, Website: www.manguang.co.za

an agency of the
Department of Arts and Culture

T: +27 21 462 4502 | F: +27 21 462 4509 | E: info@sahra.org.za
South African Heritage Resources Agency | 111 Harrington Street | Cape Town
P.O. Box 4637 | Cape Town | 8001
www.sahra.org.za

Enquiries: Ragna Redelstorff
Tel: +27 (0)21 202 8651
Email: rredelstorff@sahra.org.za
CaseID: 15154

Interim Comment

In terms of Section 38(8) of the National Heritage Resources Act (Act 25 of 1999)

Attention: INALUK Consulting services

Application for environmental authorisation for the proposed township establishment on a portion of the farm Klipfontein 716 and farm Ceres 626, Bloemfontein

The proposed project entails the establishment of a township on a portion of the farm Klipfontein 716 and farm Ceres 626, Mangaung Metropolitan Municipality, Bloemfontein, Free State Province. A draft Scoping Report and Heritage Impact Assessment (HIA) were submitted with the application.

GAIGHER, ST. 2019. PROPOSED NEW TOWNSHIP DEVELOPMENT AT MANGAUNG HERITAGE IMPACT ASSESSMENT (HIA) REPORT.

The author found no evidence of significant heritage resources within the surveyed area.

Interim comment

The SAHRA Archaeology, Palaeontology and Meteorites (APM) Unit notes the submission of the HIA and finds therein. As the proposed area is lying within an area of very high palaeontological sensitivity as per the SAHRIS PalaeoSensitivity Map, a field-based Palaeontological Impact Assessment must be conducted by a professional palaeontologist and submitted to the application. The EIA must also be submitted to the application. SAHRA APM will issue a final comment upon receipt of the above stated documents.

Should you have any further queries, please contact the designated official using the case number quoted above in the case header.

Yours faithfully

an agency of the
Department of Arts and Culture

T: +27 21 462 4502 | F: +27 21 462 4509 | E: info@sahra.org.za
South African Heritage Resources Agency | 111 Harrington Street | Cape Town
P.O. Box 4637 | Cape Town | 8001
www.sahra.org.za

Enquiries: Ragna Redelstorff
Tel: +27 (0)21 202 8651
Email: rredelstorff@sahra.org.za
CaseID: 15154

Date: Thursday July 02, 2020
Page No: 2

Ragna Redelstorff
Heritage Officer
South African Heritage Resources Agency

ADMIN:
Direct URL to case: http://www.sahra.org.za/node/537356
(DETEA, Ref: FSP/EIA/0000339/2020)

Terms & Conditions:

1. This approval does not exonerate the applicant from obtaining local authority approval or any other necessary approval for proposed work.
2. If any heritage resources, including graves or human remains, are encountered they must be reported to SAHRA immediately.
3. SAHRA reserves the right to request additional information as required.

APPENDIX E5. COMMUNICATION WITH IAP

Gmail **Amukelani Khosa <amuckhosa@gmail.com>**

Request for comments on the proposed Township development in Mangaung

14 messages

kulani@inaluk.co.za kulani inaluk.co. a Thu, un 11, 2020 at 2:24 PM
To: botav nra.co. a
Cc: amukelani inaluk.co. a, Amukelani hosa amuckhosa gmail.com

Dear Ms Bota ,

Following our conversation today , kindly find attached the BID for the proposed township development on the farms lipfontein 1 and Ceres 2 in Mangaung , Bloemfontein.

The Draft Scoping Report as well as the Traffic Impact Report is available for comments as well. We have also attached received layout plan that was made available after the BID document was circulated.

Regards

ulani Nkuna
Can.Nat.Sci (500030/15)
Environmental Assessment Practitioner

INALUK CONSULTING SERVICES

2 attachments

BID Mangaung 6 November 2019.docx.pdf
883

Klipfontein_ MARCH 2020.pdf
802

Victoria Bota (HO) Bota nra.co. a Thu, un 11, 2020 at :11 PM
To: Thobile Duma (ER) dumat nra.co. a
Cc: kulani inaluk.co. a kulani inaluk.co. a , amukelani inaluk.co. a amukelani inaluk.co. a , amuckhosa gmail.com amuckhosa gmail.com

Hi Thobile

Please find email below and attached documents for your attention.

ind regards

uoted te t hidden

2 attachments

BID Mangaung 6 November 2019.docx.pdf
883

Klipfontein_ MARCH 2020.pdf
802

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kulani@inaluk.co.za kulani inaluk.co. a Thu, ul 2, 2020 at 12:2 PM
To: ictoria Bota (HO) Bota nra.co. a , Thobile Duma (ER) dumat nra.co. a
Cc: amukelani inaluk.co. a, amuckhosa gmail.com

Dear Thobile,

ust making a follow up with regards to the below email.

uoted te t hidden

Thobile Duma (ER) dumat nra.co. a Mon, ul , 2020 at 1:3 PM
To: ictoria Bota (HO) Bota nra.co. a , ERStatutory ERStatutory nra.co. a
Cc: amukelani inaluk.co. a amukelani inaluk.co. a , amuckhosa gmail.com amuckhosa gmail.com

Good Day Nqobile

Hope all is well.

I forwarded this development documents to ERStatutory. May you please check for me who is handling it so that we can provide feedback to Amukelani.

ind Regards

Original message
From: kulani inaluk.co. a
Date: Thu, 02 ul 2020, 1:34 pm
To: ictoria Bota (HO) Bota nra.co. a , Thobile Duma (ER) dumat nra.co. a
Cc: amukelani inaluk.co. a, amuckhosa gmail.com
Subject: RE: Request for comments on the proposed Township development in Mangaung
Dear Thobile,

ust making a follow up with regards to the below email.

Regards

ulani Nkuna
Can.Nat.Sci (500030/15)
Environmental Assessment Practitioner
InalukLogo2

From: ictoria Bota (HO) Bota nra.co. a
Sent: Thursday, 11 une 2020 19:11
To: Thobile Duma (ER) dumat nra.co. a
Cc: kulani inaluk.co. a amukelani inaluk.co. a amuckhosa gmail.com
Subject: FW: Request for comments on the proposed Township development in Mangaung

Hi Thobile

Please find email below and attached documents for your attention.

ind regards

From: kulani inaluk.co. a mailto:kulani inaluk.co. a kulani inaluk.co. a mailto:kulani inaluk.co. a
Sent: Thursday, une 11, 2020 2:24 PM
To: ictoria Bota (HO) Bota nra.co. a mailto:Bota nra.co. a
Cc: amukelani inaluk.co. a mailto:amukelani inaluk.co. a Amukelani hosa amuckhosa gmail.com mailto:am

uckhosa gmail.com
Subject: Request for comments on the proposed Township development in Mangaung

Dear Ms Bota ,

Following our conversation today , kindly find attached the BID for the proposed township development on the farms lipfontein 1 and Ceres 2 in Mangaung , Bloemfontein.

The Draft Scoping Report as well as the Traffic Impact Report is available for comments as well. We have also attached received layout plan that was made available after the BID document was circulated.

Regards

ulani Nkuna
Can.Nat.Sci (500030/15)
Environmental Assessment Practitioner
InalukLogo2

---

2 attachments

image003.png
31

image001.png
52

ERStatutory ERStatutory nra.co. a Wed, ul 8, 2020 at 3:23 PM
To: ictoria Bota (HO) Bota nra.co. a , ERStatutory ERStatutory nra.co. a
Cc: amukelani inaluk.co. a amukelani inaluk.co. a , amuckhosa gmail.com amuckhosa gmail.com , Thobile Duma (ER) dumat nra.co. a

Good day ictoria,

We acknowledge receipt of your application.

our application has been received and we will advise on the progress in due course. indly complete the attached application form and submit to erstatutory nra.co. a

Regards

Erstatutory

ERStatutory

, , , ,
D: M:
erstatutory nra.co. a www.sanral.co. a
Fraud Hotline Number 0800 204 558

Please consider the environment before printing.

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From: Thobile Duma (ER) dumat nra.co. a
Sent: Monday, 0 uly 2020 13:3
To: ictoria Bota (HO) Bota nra.co. a ERStatutory ERStatutory nra.co. a
Cc: amukelani inaluk.co. a amuckhosa gmail.com
Subject: Re:Request for comments on the proposed Township development in Mangaung

Good Day Nqobile

Hope all is well.

I forwarded this development documents to ERStatutory. May you please check for me who is handling it so that we can provide feedback to Amukelani.

ind Regards

Original message
From: kulani inaluk.co. a
Date: Thu, 02 ul 2020, 1:34 pm
To: ictoria Bota (HO) Bota nra.co. a , Thobile Duma (ER) dumat nra.co. a
Cc: amukelani inaluk.co. a, amuckhosa gmail.com
Subject: RE: Request for comments on the proposed Township development in Mangaung

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Regards

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Environmental Assessment Practitioner

From: ictoria Bota (HO) Bota nra.co. a
Sent: Thursday, 11 une 2020 19:11
To: Thobile Duma (ER) dumat nra.co. a
Cc: kulani inaluk.co. a amukelani inaluk.co. a amuckhosa gmail.com
Subject: FW: Request for comments on the proposed Township development in Mangaung

Hi Thobile

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ind regards

From: kulani inaluk.co. a kulani inaluk.co. a
Sent: Thursday, une 11, 2020 2:24 PM
To: ictoria Bota (HO) Bota nra.co. a
Cc: amukelani inaluk.co. a Amukelani hosa amuckhosa gmail.com
Subject: Request for comments on the proposed Township development in Mangaung

Dear Ms Bota ,

Following our conversation today , kindly find attached the BID for the proposed township development on the farms lipfontein 1 and Ceres 2 in Mangaung , Bloemfontein.

The Draft Scoping Report as well as the Traffic Impact Report is available for comments as well. We have also attached received layout plan that was made available after the BID document was circulated.

Regards

ulani Nkuna
Can.Nat.Sci (500030/15)
Environmental Assessment Practitioner

Town Planning Subdivision-Development-Rezoning Application Form.pdf
483

Amukelani Khosa amuckhosa gmail.com Wed, ul 8, 2020 at 3:55 PM
To: ulani kulani inaluk.co. a

uoted te t hidden

17 attachments

4.png
1

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image002.png
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4.png
1

5.png
2

image002.png
41

image003.png
31

Town Planning Subdivision-Development-Rezoning Application Form.pdf
483

Amukelani Khosa amuckhosa gmail.com Mon, ul 13, 2020 at 1:30 PM
To: dumat nra.co. a
Cc: ictoria Bota (HO) Bota nra.co. a , amukelani inaluk.co. a amukelani inaluk.co. a , ulani kulani inaluk.co. a , selepe ngoti.co. a, ERStatutory nra.co. a

Good Day

The application was forwarded to the ERStatutory by Reitumetse Selepe from Ngoti Development Consultants, However we also need the comments from the environmental section, we have forwarded the BID.

Attached is the application.

ind regards,
Inaluk Consulting Services
Amukelani hosa
uoted te t hidden

---

3 attachments

SANRAL APPLICATION FORM 23 JUNE 2020.pdf
12181

ANNEXURE 1E_Klipfontein Traffic Impact Assessment 05_06_2020.pdf
11 59

ANNEXURE 1D_Klipfontein_ Layout Plan MARCH 2020.pdf
802

Mail Delivery Subsystem mailer daemon googlemail.com Mon, ul 13, 2020 at 1:30 PM
To: amuckhosa gmail.com

Message too large

our message couldn t be delivered to **selepe@ngoti.co.za** because it e ceeds the si e limit. Try reducing the message si e and resending.

The response from the remote server was:

```
552 5.3.4 Message size exceeds fixed limit
```

Final Recipient: rfc822 selepe ngoti.co. a
Action: failed
Status: 5.3.4

Remote MTA: dns 1 grid m 03.co. a. (41. 1.250.90, the server for the domain ngoti.co. a.)
Diagnostic Code: smtp 552 5.3.4 Message si e e ceeds fi ed limit
Last Attempt Date: Mon, 13 ul 2020 04:30:3 0 00 (PDT)

Forwarded message
From: Amukelani hosa amuckhosa gmail.com
To: dumat nra.co. a
Cc: ictoria Bota (HO) Bota nra.co. a , amukelani inaluk.co. a amukelani inaluk.co. a , ulani kulani inaluk.co. a , selepe ngoti.co. a, ERStatutory nra.co. a
Bcc:
Date: Mon, 13 ul 2020 13:30:09 0200
Subject: Re: Re:Request for comments on the proposed Township development in Mangaung
Message truncated

---

postmaster@nra.co.za postmaster nra.co. a Mon, ul 13, 2020 at 1:33 PM
To: amuckhosa gmail.com

Your message wasn't delivered to anyone because it's too large. The limit is 25 MB. Your message is 33 MB.

erstatutory nra.co. a

our message couldn t be sent because it s too large.

Diagnostic information for administrators:

Generating server: prod mail01.nra.co. a

erstatutory nra.co. a
Remote Server returned 550 5.2.12 RESOL ER.RST.SendSi eLimit.Org message too large for this organi ation

Administrator

, , , ,
D: M:
postmaster nra.co. a www.sanral.co. a
Fraud Hotline Number 0800 204 558

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Original message headers:

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Received: from mailcas.nra.co. a (10.1.3.34) by prod mail01.nra.co. a
 (10.1.3.222) with Microsoft SMTP Server (version=TLS1_2,
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 2020 13:33:12 +0200
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Received: from  a smtp 1.mimecast.co. a (41.74.193.103) by mailcas.nra.co. a
 (10.1.3.67) with Microsoft SMTP Server id 15.0.1347.2 via Frontend Transport;
 Mon, 13 Jul 2020 13:33:12 +0200
Received: from mail ot1 f4 .google.com (mail ot1 f4 .google.com
 [209.85.210.46]) (Using TLS) by relay.mimecast.com with ESMTP id
 za-mta-55-HSNdeCu9O2m0SjSncvg4xg-1; Mon, 13 Jul 2020 13:30:37 +0200
X-MC-Unique: HSNdeCu9O2m0SjSncvg4xg-1
Received: by mail ot1 f4 .google.com with SMTP id t18so9236400otq.5;
        Mon, 13 Jul 2020 04:30:36 -0700 (PDT)
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        d=gmail.com; s=20161025;
        h=mime-version:references:in-reply-to:from:date:message-id:subject:to
         :cc;
        bh=LRdSJxmw+t4Hp8Yxp99xc1NQLKjn2G1JobR0xlI7564=;
        b=pOFZvO2QUesycsmcoCw0KA2eOp9TY7jE0hYt+dkuz/6h5ktEafJDiOZyA8c5CHSgSE
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         aTZg==
X-Google-DKIM-Signature: v=1; a=rsa-sha256; c=relaxed/relaxed;
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         +qO+jRx7Lti7vXtoPfdpBdLiuZlAfP/cl03Rs7GkfFMaehI4JtqBMIxICeEA02hP/lds
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X-Google-Smtp-Source: ABdhPJxgZKbbN6QtfbT40/u3zwD/EXBuYugdrecGxvRfEgpWd06KyfONxI6Q2a+
9WlahNHRIBIDp6RoU7RuS8LQR4Bc=
X-Received: by 2002:a9d:2661:: with SMTP id a88mr70981826otb.74.1594639825577;
 Mon, 13 Jul 2020 04:30:25 -0700 (PDT)
MIME-Version: 1.0
References: <004e01d63feb$3c19b330$b44d1990$@inaluk.co. a>
 <1c 8 da02c994 c4ab13cfcc a883d8f nra.co. a>
 <000201d6505b$4e06e8d0$ea14ba70$@inaluk.co. a>
 < j o bbjk3g i03dpd 5n3tvbplbwwdbh1d3l 32q sg83q25j j ief5 bi95qtp ww ryd 5e11kh kvfaf pilko0
krce ub iaewnrnmlq jhyrmq fuiukv53 b18 iu 88p 943h491l5n9p.1593 84195 48 email.android.com>
 <dda3b85 54ec4df3951da 14cf 51d1c nra.co. a>
In-Reply-To: <dda3b85 54ec4df3951da 14cf 51d1c nra.co. a>
From: Amukelani Khosa <amuckhosa gmail.com>
Date: Mon, 13 Jul 2020 13:30:09 +0200
Message-ID: <CANLONFvOPqT 5 E cBjCa1 9 fU88 Zq 8 4 pmOS9qG dFv mail.gmail.com>
Subject: Re: Re:Request for comments on the proposed Township development in Mangaung
To: <dumat nra.co. a>
CC: "Victoria Bota (HO)" <Bota nra.co. a>, "amukelani inaluk.co. a"
        <amukelani inaluk.co. a>, Kulani <kulani inaluk.co. a>, <selepe ngoti.co. a>,
        <ERStatutory nra.co. a>
X-Mimecast-Spam-Score: 0
X-Mimecast-Impersonation-Protect: Policy=New Impersonation Protection Definition;Similar Internal
Domain=false;Similar Monitored External Domain=false;Custom External Domain=false;Mimecast External
Domain=false;Newly Observed Domain=false;Internal User Name=false;Custom Display Name List=false;Reply-
to Address Mismatch=false;Targeted Threat Dictionary=true;Mimecast Threat Dictionary=true;Custom Threat
Dictionary=false;
Content-Type: multipart/mixed; boundary="0000000000005c83ae05aa510476"
Return-Path: amuckhosa gmail.com
```

Final Recipient: rfc822 erstatutory nra.co. a
Action: failed
Status: 5.2.12
Diagnostic Code: smtp 550 5.2.12 RESOL ER.RST.SendSi eLimit.Org message too large for this organi ation

noname
5

postmaster@nra.co.za postmaster nra.co. a Mon, ul 13, 2020 at 1:33 PM
To: amuckhosa gmail.com

Your message wasn't delivered to anyone because it's too large. The limit is 25 MB. Your message

is 33 MB.

dumat nra.co. a

our message couldn t be sent because it s too large.

Diagnostic information for administrators:

Generating server: prod mail03.nra.co. a

dumat nra.co. a
Remote Server returned 550 5.2.12 RESOL ER.RST.SendSi eLimit.Org message too large for this organi ation

Administrator

, , , ,
D: M:
postmaster nra.co. a www.sanral.co. a
Fraud Hotline Number 0800 204 558

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Original message headers:

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Received: from mailcas.nra.co. a (10.1.3.34) by prod mail03.nra.co. a
 (10.1.3.224) with Microsoft SMTP Server (version=TLS1_2,
 cipher=TLS_ECDHE_RSA_WITH_AES_128_CBC_SHA256) id 15.1.1261.35; Mon, 13 Jul
 2020 13:33:03 +0200
Received: from  a smtp 1.mimecast.co. a (41.74.193.103) by mailcas.nra.co. a
 (10.1.3.67) with Microsoft SMTP Server id 15.0.1347.2 via Frontend Transport;
 Mon, 13 Jul 2020 13:33:02 +0200
Received: from mail ot1 f4 .google.com (mail ot1 f4 .google.com
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Final Recipient: rfc822 dumat nra.co. a
Action: failed
Status: 5.2.12
Diagnostic Code: smtp 550 5.2.12 RESOL ER.RST.SendSi eLimit.Org message too large for this organi ation

noname
5

postmaster@nra.co.za postmaster nra.co. a Mon, ul 13, 2020 at 1:33 PM
To: amuckhosa gmail.com

Your message wasn't delivered to anyone because it's too large. The limit is 25 MB. Your message is 33 MB.

ictoria Bota (HO) (botav nra.co. a)

our message couldn t be sent because it s too large.

Diagnostic information for administrators:

Generating server: prod mail02.nra.co. a

botav nra.co. a
Remote Server returned 550 5.2.12 RESOL ER.RST.SendSi eLimit.Org message too large for this organi ation

Administrator

, , , ,
D: M:
postmaster nra.co. a www.sanral.co. a
Fraud Hotline Number 0800 204 558

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Original message headers:

```
Received: from mailcas.nra.co. a (10.1.3.34) by prod mail02.nra.co. a
 (10.1.3.223) with Microsoft SMTP Server (version=TLS1_2,
 cipher=TLS_ECDHE_RSA_WITH_AES_128_CBC_SHA256) id 15.1.1261.35; Mon, 13 Jul
 2020 13:33:22 +0200
Received: from  a smtp 1.mimecast.co. a (41.74.193.103) by mailcas.nra.co. a
 (10.1.3.67) with Microsoft SMTP Server id 15.0.1347.2 via Frontend Transport;
 Mon, 13 Jul 2020 13:33:22 +0200
Received: from mail ot1 f4 .google.com (mail ot1 f4 .google.com
  uoted te t hidden
```

Final Recipient: rfc822 botav nra.co. a
Action: failed
Status: 5.2.12
Diagnostic Code: smtp 550 5.2.12 RESOL ER.RST.SendSi eLimit.Org message too large for this organi ation
Display Name: ictoria Bota (HO)

noname
5

Amukelani Khosa amuckhosa gmail.com Mon, ul 13, 2020 at 3:28 PM
To: dumat nra.co. a
Cc: ictoria Bota (HO) Bota nra.co. a , amukelani inaluk.co. a, ulani kulani inaluk.co. a , selepe ngoti.co. a, ERStatutory nra.co. a

uoted te t hidden

2 attachments

SANRAL APPLICATION FORM 23 JUNE 2020.pdf
12181

ANNEXURE 1D_Klipfontein_ Layout Plan MARCH 2020.pdf
802

Thobile Duma (ER) dumat nra.co. a Mon, ul 13, 2020 at :18 PM
To: Amukelani hosa amuckhosa gmail.com
Cc: ictoria Bota (HO) Bota nra.co. a , amukelani inaluk.co. a amukelani inaluk.co. a , ulani kulani inaluk.co. a , selepe ngoti.co. a selepe ngoti.co. a , ERStatutory ERStatutory nra.co. a , Ravi Ronny (ER) ronnyr nra.co. a , Dudley Mbambo (ER) MbamboD nra.co. a , ksems ksems.co. a ksems ksems.co. a , simone ksems.co. a simone ksems.co. a

Good Day Amukelani

Hope all is well.

The feedback you will receive from ER Statutory will include consolidated comments from SANRAL (inclusive of environmental comments).

Please register us as Interested and Affected Party at this stage.

Please note that the proposed housing development lies within or in close pro imity to the proposed SANRAL N8 Ring Road Route Corridor (See attached). SANRAL is busy finali ing the scoping report for submission to DEFF. I have copied SEMS (EAP for the N8 Ring Road) to provide further clarity should you have additional questions.

I suggest that you request your design engineers to setup a meeting with SANRAL Design and Construction Department (Mr Ravi Ronny , copied on this e mail) to confirm whether you are indeed within or outside the N8 Ring Road Corridor.

Please ensure that your development considers Noise and Air uality impacts of siting a housing development in close pro imity to a National Road.

Thobile Duma

Eastern Region
58 van Eck Place ,Mkondeni, Pietermarit burg, waZulu Natal, 3200, South Africa
T: 033 392 81 **| M: 083 328 0989**
dumat nra.co. a **| www.sanral.co.za**
Fraud Hotline Number - 0800 204 558

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uoted te t hidden

Proposed N8 Ring Road Route Corridor.pdf
54

Amukelani Khosa amuckhosa gmail.com Tue, ul 14, 2020 at 11:5 AM
To: Thobile Duma (ER) dumat nra.co. a
Cc: ictoria Bota (HO) Bota nra.co. a , amukelani inaluk.co. a amukelani inaluk.co. a , ulani kulani inaluk.co. a , selepe ngoti.co. a selepe ngoti.co. a , ERStatutory ERStatutory nra.co. a , Ravi Ronny (ER) ronnyr nra.co. a , Dudley Mbambo (ER) MbamboD nra.co. a , ksems ksems.co. a ksems ksems.co. a , simone ksems.co. a simone ksems.co. a

Good Day

Thank you for the feedback , we will register you as Interested and Affected Parties.

ind Regards
Inaluk Consulting Services
Amukelani hosa

uoted te t hidden

Gmail **Amu elani hosa amuc hosa gmail com**

angaung ownshi Establishment

Amu elani hosa amuckhosa@gmail.com Thu, Jul 2, 2020 at 12:16 PM
To: Mpolokeng.Ramongalo@mangaung.co.za
Cc: Kulani kulani@inaluk.co.za , amukelani@inaluk.co.za

Good Day

Aramex returned the document back to us, as they did not get anyone to sign for it for a month. Please find attached tracking documents. We are still waiting for Aramex to deliver the returned report to the office , it has been sitting in the Pretoria depot from 23 june 2020.

In the meantime can we send the wetransfer link of the Scoping Report for you to download if its not a problem

Kind Regards

Inaluk Consulting services

Amukelani Khosa

2 attachments

retrun re ort to retoria IF 79K

unici alit e ort trac ing IF 115K

Gmail **Amukelani Khosa <amuckhosa@gmail.com>**

Submission of Draft scoping Report

2 messages

kulani@inaluk.co.za kulani@inaluk.co.za Tue, May 12, 2020 at 10:49 AM
To: mpoleng.ramongalo@mangaung.co.za, amukelani@inaluk.co.za
Cc: Amukelani Khosa amuckhosa@gmail.com

Dear Ms Ramongalo ,

We have couriered the draft scoping report for the proposed Township establishment on Farm Klipfontein and Ceres 626 in Mangaung , (your project ref EIA/12/2019) . The courier company Aramex could not get access to the building and the telephone lines are not answered as well.

Please advise of an alternative address for delivery and cell number . the document is currently at the Bloemfontein depot.

Regards

Kulani Nkuna
Can.Nat.Sci (500030/15)
Environmental Assessment Practitioner

INALUK
CONSULTING SERVICES

Amukelani Khosa amuckhosa@gmail.com Tue, May 12, 2020 at 11:51 AM
To: Mpolokeng.Ramongalo@mangaung.co.za
Cc: Kulani kulani@inaluk.co.za

Dear Ms Ramongalo ,

We have couriered the draft scoping report for the proposed Township establishment on Farm Klipfontein and Ceres 626 in Mangaung , (your project ref EIA/12/2019) . The courier company Aramex could not get access to the building and the telephone lines are not answered as well.

Please advise of an alternative address for delivery and cell number . the document is currently at the

Bloemfontein depot.

Regards

Amukelani Khosa

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Gmail **Amukelani Khosa <amuckhosa@gmail.com>**

Draft scoping Report for the proposed township establishment on portion of farm Klipfontein 716 and farm Ceres 626 within the Mangaung Metropolitan Municipality.

2 messages

Amukelani Khosa amuckhosa@gmail.com Wed, Jun 17, 2020 at 3:20 PM
To: jack@fs.agric.za, pietersen@dws.gov.za, ivian.minnaar@mangaung.co.za, Mpolokeng.Ramongalo@mangaung.co.za

Good Day

I hope this email finds you well.

In line with the Environmental Impact Assessment Requirements of 07 April 2017, Interested and Affected Parties (I&APs) must be notified about this project and / or provide comments on issues of concern that will be considered during the Scoping process.

This email is a reminder to provide/ send us detailed comments on the draft scoping report , for the above mentioned that was couriered to your department.

Kind regards
Inaluk Consulting Services
Amukelani Khosa

Mpolokeng M.H. Ramongalo Mpolokeng.Ramongalo@mangaung.co.za Thu, Jun 25, 2020 at 9:25 AM
To: Amukelani Khosa amuckhosa@gmail.com

Greetings

Can you kindly tell me who signed for the report so that I can go collect them

Regards

Mpolokeng

uoted text hidden

Gmail

Amukelani Khosa <amuckhosa@gmail.com>

Case ID 15154 : Application for environmental authorisation for the proposed township establishment on a portion of the farm Klipfontein 716 and farm Ceres 626, Bloemfontein

2 messages

Amukelani Khosa amuckhosa@gmail.com Mon, Jun 29, 2020 at 3:58 PM
To: rredelstorff@sahra.org.za
Cc: Kulani kulani@inaluk.co.za , amukelani@inaluk.co.za

Good Day

With reference to the above project Draft Scoping Report and Heritage Specialist Report were uploaded on the SAHRA website on 11/06/2020. We noted that we have not yet received the written comments from SAHRA.

The email serves as a reminder to kindly provide us with the written comments.

Kind Regards
Inaluk Consulting services
Amukelani Khosa

irus-free. www.avg.com

Ragna Redelstorff rredelstorff@sahra.org.za Thu, Jul 2, 2020 at 3:27 PM
To: Amukelani Khosa amuckhosa@gmail.com
Cc: Kulani kulani@inaluk.co.za , amukelani@inaluk.co.za amukelani@inaluk.co.za

Good afternoon,

Please note that SAHRA has commented on your application. To download the comment please go to your application on SAHRIS: https://sahris.sahra.org.za/cases/application-environemntal-authorisation-mangaung.

Kind regards,

Ragna Redelstorff

Please note that due to the Corona virus outbreak I will be working from home so will not be available via my office phone. I am still available via email and on SAHRIS.

uoted text hidden

Ragna Redelstorff, Ph.D.
Heritage Officer Archaeology, Palaeontology & Meteorites Unit

South African Heritage Resources Agency
- A nation united through heritage -

T: 27 21 4624502/ 8651 C: F: 27 21 202 4509
E: RRedelstorff@sahra.org.za 111 Harrington Street Cape Town

www.sahra.org.za
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SAHRA Logo

APPENDIX E6. CORRESPONDENCE AND MINUTES OF ANY MEETINGS

INALUK CONSULTING SERVICES
Tel No.: 072 783 4002 / 072 081 2130
Email: info@inaluk.co.za
Address: 29 Tulana, Jozini Street, Moreleta Park, 0181
www.inaluk.co.za

COMMENTS FROM THE PUBLIC MEETING

Site Notices

Five (4) site notices were fixed in conspicuous places around the proposed site on Friday, 08th November 2019. The site notices gave a brief description of the project and Interested and/ or Affected Parties will be invited to register on the database of the proposed project and to raise any issues concerns about the project within 30 days.

Public Meeting

A public meeting was held on 30th of November 2019, at Mangaung, at 10h00 .The purpose of the meeting was to inform I&APs of the proposed development, discuss any issues or concerns they may have, obtain their inputs and comments and allow them an opportunity to register to participate in the process.

The following surrounding landowners were also identified of the project by means of Background Information Document, and afforded the opportunity to comment on the project by means of Interested and Affected Parties comments form:

- Mr Marco Tortius (land owner of portion of Klipfontein) and El-Azaar Chicken Farm
- Mr Isaac Foster Resident (portion of farm Klipfontein)

No person attended the meeting.

The landowners were given the BID also contacted several times with no response.

Yours sincerely,

Mrs Kulani Nkuna
Tel: 072 783 4002
E-mail: kulani@inaluk.co.za

APPENDIX F: IMPACT ASSESSMENT

IMPACT ASSESSMENT

FOR THE PROPOSED TOWNSHIP ESTABLISHMENT ON PORTION OF FARM KLIPFONTEIN 716 AND FARM CERES 626 WITHIN THE MANGAUNG METROPOLITAN MUNICIPALITY

Prepared For:

Department of Economic Small Business Development, Tourism and Environment Affairs (DESTEA).

Prepared By:

Inaluk Consulting Services

ENVIRONMENTAL MITIGATION AND MANAGEMENT MEASURES

These guidelines will form the basis for environmental mitigation and management on site. The appointed Environmental Control Officer (ECO) will ensure that any modifications are communicated, explained to and discussed with all the Interested and Affected Parties (i.e. the authorities, contractor, the proponent and any directly affected party who requests this information).

- Mitigation of the potential impact in regard to the
  - Potential to mitigate any negative impacts
  - Potential to optimize any positive impacts
  - The likelihood of successful mitigation

- Overall assessment and general comments as to the predicted impacts of the development after mitigation in terms of such criteria as may be relevant to a particular impact, and which may include the following aspects :

  - The severity and permanence of the impact on either local biota or surrounding human communities
  - The size of the affected communities and their relative significance
  - The general ecological and socio – economic context within which a particular impact would occur
  - The final balance of between positive and negative impacts, and related costs and benefits to society.

Pre-construction and construction phases

Establishment of environmental governing bodies

- **Establishment of Environmental Monitoring Committee (EMC)**

An Environmental Monitoring Committee needs to be established with representatives of I&APs, relevant authorities and the holder of an Environmental Authorization. The role of this EMC is to monitor the environmental compliance during all phases of the project and satisfy as far as possible the issues and concerns of all parties involved in or affected by the project.

- **Appointment of Environmental Control Officer (ECO)**

An Environmental Control Officer will fulfil the responsibility of assuring that environmental performance is achieved by the developer and its contractors during all phases of the project. It is the responsibility of the ECO to audit compliance with the commitments set out in this EMP, and assist with the implementation of mitigation measures. The contractor and / the clients representative (ECO) will inspect all the construction activities on a monthly basis. All issues highlighted in this Environmental Management Plan will be investigated and compliance with the mitigation measures audited. Preceding complaints, concerns or incidents reported in the logbook will also be monitored.

Feedback of the findings, changes to this document as well as all reported incidents will be reported at the monthly progress meetings between the Consulting Engineer, Contractor and Client Representative. A summary of these reports will also be forwarded to the Free State Department of Economic Small Business Development, Tourism and Environment Affairs (DESTEA), and the measures to rectify the issue stated. Any previous findings must be audited to confirm the successful implementation thereof. At the end of the project a summary document will be prepared and presented to the Department of Economic Small Business Development, Tourism and Environment Affairs (DESTEA).

Establishment of complaints register

A complaints register is to be established and kept onsite to address complaints in a timorous fashion, which will be reported to the EMC.

Responsibilities and timeframes for the pre-construction phase

Number	Establishment of Environmental Governing Bodies	Responsibility	Timeframe

1.	**Establishment of Environmental Monitoring Committee (EMC):** Establish an Environmental Monitoring Committee with I&APs' representatives. Formal agreement regarding the frequency of meetings and agenda must be reached.	Environmental consultant(s)/specialist(s)	During the lifetime of the project (from pre-construction through operation and maintenance phases).
2.	**Appointment of Environmental Control Officer (ECO):** Developer to appoint the ECO for the project.	Developer	Pre-construction, construction and operation and maintenance phases.
3.	**Establishment of a complaints register:** Environmental complaint register to be maintained: ✓ All complaints with regards to environmental non-compliance on the construction site need to be recorded and addressed accordingly. ✓ Establish an Environmental complaints register. ✓ Address complaints timorously and report back to EMC meetings. ✓ Open liaison channels should be identified and developed to ensure that all queries, complaints from affected individuals/ parties may be addressed with the shortest possible delay.	Site engineer and contracts managers will be responsible for maintaining the register and report any complaints received to the ECO	During construction, operation and maintenance phases

Assessment Approach to environmental issues during the construction phase

The assessment and description of identified environmental issues were conducted according to the structure and approach detailed below. The following is a brief description of how these impacts were identified and rated. The approach may be tailored and altered where required to deal adequately with the description and assessment of a specific impact.

A description of the nature of the potential issues as to its:

- General background and context within this application
- Causes and effect
- Who or what will be affected
- How it will be affected

Assessment of the impact as to:

- Probability
- Duration
- Extent
- Reversibility
- Magnitude

The table below shows how each impact was assessed and is an elaboration of the approach used in identifying rate these impacts.

Potential issue	**Criteria**	**Description of elements that are central to each issue**
Description	Nature	What causes the effect?
		Who will be affected?
		What will be affected?

		How will it be affected?
	Probability	Certain / may not occur with mitigation.
	Status	Positive (beneficial impact); negative (deleterious or adverse impact); or neutral (impacts is either beneficial or diverse).
Assessment	Extent	Is the impact site specific?
		Does the impact extend locally, i.e. to the site and its nearby surroundings?
		Does the impact extend regionally, i.e. have an impact on the region.
		Does the impact extend nationally, i.e. have an impact on a national scale.
	Duration	Short term, i.e. 0-5 years.
		Medium term i.e. 5-11 years.
		Long term, i.e. impact ceases after the construction or operational life cycle.
		Permanent, i.e. mitigation either by natural process or by human intervention will not occur in such a way or in such a time span that the impact can be considered transient.
	Magnitude	Low, i.e. natural and social functions and processes are not affected or minimally affected.
		Medium, i.e. affected environment is notably altered. Natural and social functions and processes continue albeit in a modified way.
		High, i.e. natural or social functions or processes could be substantially affected or altered to the extent that they could temporarily or permanently cease.
	Reversibility	Impact is reversible or irreversible.

	Cumulative or non-cumulative	Potential of two or more impacts to combine to form cumulative or synergistic impacts.

Identified Impacts for the construction of the township development

No.	Impact	Description		Assessment					
		Nature	***Probability***	***Status***	***Extent***	***Duration***	***Magnitude***	***Reversibility***	***Cumulative/ Non-cumulative***
1	**Noise**: It is expected that the construction activities will cause noise pollution in the area during working hours.	The current site is a vegetation land surrounded by residential area and the noise is expected to be not higher than the allowable	The probability of change is certain with regard to the potential sources of noise pollution during construction phase.	An increase in noise pollution would be a negative impact to the surrounding environment.	The impact would be site specific and in the local environment.	During construction phase due to construction vehicles and machinery.	Medium.	Reversible, after completion of the construction the noise level will return to the initial state.	Cumulative, an increase in noise due to construction activity or vehicles.

		ambient noise limit.							
2	**Dust:** The creation of dust would be evident in the area during construction	The current site is vacant and open space. Dust pollution at site is at moderate level. Increase of dust level during construction phase could have an impact to the air quality.	During construction period the dust level could rise as a result of heavy construction vehicles movement and the construction itself.	An increase in dust would be a negative impact to the surrounding environment.	The impact would be site specific and in the local environment.	The impact would only result during the construction phase	Medium.	Reversible, after completion of the construction the dust level will be lower than the initial state.	Non-cumulative

3	**Soil erosion**: The construction activities for the development of the township have the potential to create soil erosion.	The current environmental site is an open space evidenced with grazing of cattle and donkeys.	The probability of change is uncertain during construction phase.	The current site infrastructure designs does cater for the Storm Water Management. If it is not addressed in the proposed development it could increase the impact.	The impact would be site specific.	Might occur only during construction phase. Short term.	Medium. The surrounding might be negatively affected.	Reversible, when the construction is completed, the storm water management in the area is improved, intern soil erosion issue could be addressed.	Non-cumulative. If the proposed development design addresses the storm water management issue.
4	**Waste disposal:** Uncontrolled and random disposal of waste has a	The existing current site is affected by poor waste disposal on some parts of	The probability of change is uncertain.	An increase in waste and improper disposal might result in an encouragement	Impact would be site specific and in the local	Only during construction phase.	Medium.	If well managed, it can be reversed or	Non-cumulative.

	negative effect on the health status of the local environment.	the proposed site.		of illegal dumping site establishment that could later pose serious environmental health hazard to the environment.	environment.	Short term.		even avoided.	
5	**Mixing of concrete:** Concrete residue when left to harden can create areas which can be difficult to	The current site is free from concrete slabs, proper measures need to be implemented to avoid adverse impacts.	The probability of change is uncertain which may rise as a result of dry concrete mixture left during construction.	If concrete mixing is not well managed and left to dry it may result into concrete slab formation or negatively impact to the surrounding.	Impact would be site specific and in the local environment.	This might permanently affect the soil.	Medium. The soil character might be changed.	Reversible.	Non-cumulative.

	remove or rehabilitate.								
6	**Waste generation and disposal:** Waste generation and inappropriate disposal could lead to wide array of environmental problems i.e. soil, surface contamination	The current state of the site is affected by illegal waste disposal.	The probability of change is uncertain.	Generated waste and disposal method could be sources of pollution.	Impacts could be site specific and in the local environment.	If waste management plans are not in place this could be a long term effect.	High.	If well managed, it can be reversible.	Cumulative.

7	**Hazardous waste:** Various hazardous materials, construction waste and by-products as thinners and oils used during construction could become sources of pollution if not disposed of in an appropriate manner.	The current state of the site is free from toxic chemicals.	The probability of change is uncertain depending on the management.	Hazardous substances if not managed or used in an appropriate manner can be sources of pollution.	Impacts would be site specific and could extend to regional environment.	Short term if early managed.	High.	If well managed can be reversible.	Cumulative

9	**Endemic flora and fauna:** Endemic flora and fauna in and around the construction site should be protected as much as possible.	The site is an undisturbed land, disturbance to the vegetation is expected during the construction.	The probability of change is certain.	The current state of the site pose impact to flora and fauna during vegetation clearance (this can be minimal)	The impact could be site specific and in the local environment.	Permanent.	Low.	It could be reversible or rehabilitated.	Cumulative.

10	**Storm water runoff:** Uncontrolled storm water runoff could create various problems such as soil erosion.	A wetland exist on the targeted site, poor storm water management could lead to the wetland accumulating the waste water.	The probability of change is certain.	If storm water is not properly managed, during rainy season water could be stagnant or erode soil and that could also lead to the environment being unhygienic.	The impacts would be site specific and in the local environment.	Short term.	Low.	Not applicable.	Non-cumulative.
11	**Storage of equipment and materials:** Equipment and materials if not stored in an	Materials and equipment storage should be done properly to eliminate injuries and accidents.	The probability of change is uncertain.	Equipment and materials if not stored in an appropriate manner could be sources of pollution.	Impacts would be site specific and in the local environment.	Short term.	Low.	If well managed it can be reversible	Non-cumulative.

	appropriate manner could be a source of pollution.								
12	**Vehicle maintenance and refueling:** Spillages of hazardous liquids such as fuel, engine oil and other liquids used during vehicle maintenance and equipment	Looking at the magnitude of the project, a lot of mobile equipment are expected.	The probability of change is uncertain.	Oil/Hydrocarbons spillages would be a negative impact to the current environment.	Impacts would be site specific and in the regional environment. As a results of the highly soluble rock type of the area.	Short term.	Medium.	Could be reversible when construction is completed.	Could be cumulative. Soil characteristic could change and species and plant could be destroyed in the area.

	handling on the ground surface could result into contaminatio n of soil, surface water and ground water.								
13	**Vehicle and Equipment washing:** Spillages of washing detergents and wash water containing detergents	The site is not contaminated by any spillage of washing detergents or oil.	The probability of change is uncertain.	An increase in washing detergents would have a negative impact. This has to be avoided.	Impacts would be site specific	Short term if well managed	High.	If appropriately managed it could be reversed.	Non-cumulative.

	and oils could impact the environment negatively.								
14	**Labour force:** Environmentally unfriendly actions and lack of good social behavior of the Labour force can create various problems (i.e. as crime, pollution.)	The targeted site is situated amongst residential, agricultural areas and accessed by near-by locals.	The probability of change is uncertain.	The current local communities is faced with high unemployment rate, the proposed project will create several jobs within community.	Impacts would be site specific and in the local community.	Permanent.	Not applicable.	Permanent.	Not applicable.

15	**Temporary Jobs:** It is important to use local labour where possible and comply with the public requirement for the proposed development.	A place/site where development is to be located, job seekers are always around the area for an employment.	The probability of change is uncertain	Unemployment is a negative effect in and around the local community. Not employing the local labours could impact the project negatively.	Impacts could be site specific and in the local community however could extend to national.	Permanent.	Not applicable.	Not applicable.	Not applicable.
16	**Security and Crime:** Security on the construction site needs to be maintained.	Vacant land at this stage of reporting	The probability of change is uncertain.	Vacant land at this stage of reporting	The impacts could be site specific and in the local communit	Permanent.	Medium.	Low.	Non-cumulative

	Construction work and related activities are usually associated with an increase in criminal incidents in the area where development occurs.				y. However it could extend				
17	**Fire prevention and control:** The activities that take	The site currently does not have any activities that may pose fire	The probability of change is uncertain.	The presence of construction operation could	Impacts could be site specific and in the	Short term.	Medium.	Low.	Cumulative.

	place in the contractor's camp may pose a threat of the creation of fires. Therefore appropriate measures are to be taken.	threats except out of natural course.		pose fire hazards.	local environment				
18	**Safety and access control:** Sufficient safety measures should be taken to avoid unnecessary	Safety in areas of high unemployment rate is always a concern.	The probability of change is certain.	Safety is currently a big concern to the community members as they are affected by crime. The construction could be	Impacts would be site specific and in the local environment.	Short term.	Medium.	Non reversible.	Non-cumulative But could cumulate if not managed.

	accidents and/or injuries.			affected by criminal elements which would in turn increase crime statistics in the area.					
19	**Material handling:** Handling of materials such as fuels, grease and oils must be supervised daily on a continuous basis.	The site is currently without material such as fuels, grease storages.	The probability of change is certain during construction period.	The hydrocarbon materials if not stored in an appropriate manner can be sources of pollution.	Impacts would be site specific and also extend to regional environment.	Short term if not managed well.	Low, if well managed.	Reversible if well managed.	Non-cumulative.

20	**Survey points:** The surrounding environment must be taken into consideration when survey operations are to be performed.	The site boundaries are given and need to be clearly pegged.	The probability of change is certain.	If boundaries are not clearly demarcated, construction activity can have impact on neighboring site.	Impacts would be site specific and in the local environment.	Short term.	Low.	Reversible.	Non-cumulative.
21	**Construction camp**: The choice of site for the contractors' camp requires the Environmenta	Location of site camps is significant, To avoid unnecessary negative impacts	The probability of change is uncertain.	Construction camps are associated with environmental impacts, if not properly	Impacts would be site specific and in the local	Medium term.	Medium.	Irreversible.	Non-cumulative.

	l Control Officer and Engineers permission, and must take into account location of local villagers and or ecological sensitive areas.			selected and managed.	environm ent.				
22	**Workers conduct on site:** A general regard for the social and ecological	The site is currently not used.	The probability of change is uncertain depending on the workers behavior.	Workers conduct could have a negative impact on the surrounding neighbors.	Impacts would be site specific and in the local	The duration of the impact is project	Low.	Reversible.	Non-cumulative

	well-being of the site and adjacent areas is expected of the site staff. The presence of construction employees in the area could impact negatively to the social life of the local community.				environment.	term related.			

Proposed mitigation and management

<table>
<tr><th>Mitigation</th><th>Impact and proposed mitigation

and management actions</th><th>Responsibility</th><th>Timeframe</th></tr>
<tr><td>Potential to mitigation negative impact</td><td rowspan="2">Description of mitigation measures. Extent to which mitigation measures could influence the significance and status of impact.

Where ever possible a description of the optimization measures. Extent to which they could influence the significance of impact.</td><td rowspan="2">The responsible person to ensure that the mitigation measures are taken</td><td rowspan="2">Implementation period for the mitigation</td></tr>
<tr><td>Potential to enhance positive impacts</td></tr>
<tr><td rowspan="3">Significant rating of impact after mitigation</td><td colspan="3">Low, i.e. natural and social functions and processes are not affected or minimally affected.</td></tr>
<tr><td colspan="3">Medium, i.e. affected environment is notably altered. Natural and social functions and processes continue albeit in a modified way.</td></tr>
<tr><td colspan="3">High, i.e. natural or social functions or processes could be substantially affected or altered to the extent that they could temporarily or permanently cease.</td></tr>
</table>

Comment on the overall assessment and conclusion.	Overall Assessment and concluding comments as to the predicted impacts after mitigation and their: ✓ Severity and permanence ✓ Size and relative significance ✓ Ecological and socio – economic context ✓ Balance between positive and negative aspect ✓ Cost and benefits ✓ Acceptability / Unacceptability

Proposed mitigation and management

No.	Impact	Mitigation		Responsibility	Timeframe	Significant rating of impact after mitigation	Comment on the overall assessment and conclusion
		Potential to mitigate negative impacts	Potential to mitigate positive impacts				
1.	Noise	✓ Construction and other noise generating activities should be restricted to between 06h00 and 18h00 Monday to Friday, unless otherwise approved by the appropriate competent person in consultation with	Not applicable	Contractor	During construction	Low	If construction vehicles are serviced and properly maintained the level of noise should be less.

		adjacent landowners/affected persons and ECO. ✓ During the operational phase all activities must take place in a manner that will allow as little noise as possible. ✓ Activities, which are deemed to generate high levels of noise, will be restricted to normal working hours.					
2.	Dust	✓ The liberation of dust into the surrounding environment shall be	Not applicable	Contractor	During construction	Low	The level of dust should be reduced to minimal as the result of water spraying during working hours and

		effectively controlled by the use of, water spraying. ✓ The speed of haul trucks and other vehicles must be strictly being controlled to avoid dangerous conditions, excessive dust or deterioration of the road being used. ✓ Site clearance to be done only as needed in phases.					pilling of soil should be avoided where ever possible.
3.	Soil erosion	✓ Submission of an operational plan for the construction	Not applicatio n	Contractor	During constructio n phase	Low	The design lay out plan should address all issues relating to storm water management and soil

		phase indicating technical and management measures to prevent soil erosion. ✓ Stock piled topsoil should not be compacted and should be replaced as final soil layer. ✓ Soil should be exposed for the minimum time possible once cleared of vegetation, i.e. the timing of clearing and grubbing should be co-ordinate as much as possible to					erosion. This could be a complete mitigation of this soil erosion.

		avoid prolonged exposure of soils to wind and water erosion. ✓ The A-horizon will be removed and used for rehabilitation purposes. The lower soil horizons will be used for construction activities. The A-horizon will be stockpiled in a responsible manner and replaced during rehabilitation.					
4.	Waste generati	✓ A waste management plan to	Not applicatio n	Contractor	During constructio n	Low	Waste removal should be done regularly and that could make the environment free from any hazards.

	on and disposal	be developed for the construction site. ✓ Plan to ensure that all waste is contained in suitable containers to prevent waste being washed into water bodies. ✓ Containers for waste to ensure that any fluids generated by waste are trapped and can be disposed of in a suitable.					This could completely mitigate this impact.
5.	Mixing of concrete	✓ Where concrete has been mixed, especially in the natural environment, all residues must be	Not applicable	Contractor	During construction	Low	Unused cement should not be left to dry on the ground. If proper housekeeping rules are complied with, most impacts should not affect the environment.

		removed and disposed of in an environmentally responsible manner approved by the ECO.					
6.	Sewage disposal	✓ The contractor to install adequate portable chemical toilets to meet the sanitation needs on the construction site (14 people per toilet).	Not applicable	contractor	During construction and maintenance	Low or completely mitigated	Ablution facility should be made available during construction phase for the employee to able to use this facility. All type of waste should be classified and disposed in an appropriate registered waste disposal site.

7.	Hazardous substances	✓ Hazardous materials to be stored correctly, marked, labelled, without the risk of contamination and hazardous waste to be disposed of correctly with the necessary certificates issued. ✓ All oils, hydraulic fluids and other hazardous materials will be stored in suitable containers in a structure or facility designated for this purpose. ✓ Material Safety Data Sheets (MSDSs)	Non-applicable	Contractor in co-operation with the ECO	During construction	Low	Employees dealing with hazardous substances should be trained and be competent to do so. This could completely mitigate reduce the risk posed by this impact.

		shall be readily available on site for all chemicals and hazardous substances to be used on site. ✓ Storage areas containing hazardous substances must be clearly signed and the designated person contact and names should be displayed. ✓ Residents living adjacent to the construction site must be notified of the existence of the					

		hazardous storage area. ✓ Staff dealing with these materials/substances must be aware of their potential impacts and follow the appropriate safety measures.					
8.	Endemic flora and fauna	✓ No endemic flora and fauna species will be deliberately destroyed or permanent alienated from their natural habitat during construction.	Not applicable	Contractor and ECO	During construction	Low	Identified indigenous plants and species existing in the area will be protected by all means.

		✓ Excavations left open during construction should be checked periodically such that animals falling in can be safely removed and released away from construction activities. All excavations should be filled as soon as possible. ✓ Construction staff should be advised not to chase, kill or catch animals found or encountered during construction.					

		✓ Only vegetation falling in directly in demarcated in operational area should be removed where necessary. ✓ No exotic/invasive plants are to be planted on common ground of the site. ✓ No vegetation will be removed without prior permission from ECO.					
9.	Storm water runoff	✓ To prevent storm water damage, the increase in storm water run-off resulting from	Not applicable	contractor	During construction	Low	This should be able to address soil erosion as well as the design of the site should have appropriate storm water management as well as

		construction activities must be estimated and the drainage systems assessed accordingly. ✓ A drainage plan must be submitted to the Engineer for approval and must include the location and design criteria of any temporary stream crossing. ✓ All storm water runoff from compacted materials must be monitored if					drainage system that should have oil trap/ filters if necessary.

		signs of erosion become apparent.					
10.	Storage of equipment and materials	✓ Choice of location for storage areas must take into account prevailing winds, exposure sun, distance to water bodies and general onsite topology. ✓ All equipment and materials must be stored in a designated area in an appropriate manner as to prevent pollution.	Not applicable	Contractor	Throughout the lifecycle of a project	Low	If employees on site shall practice good housekeeping behavior, the work condition will be free of injuries and everything would be in its place and there will be space for everything.

		✓ Storage areas must be designated, demarcated and fenced as effective as possible. ✓ Fire prevention facilities must be present and accessible at all times.					
11.	Vehicle maintenance and refueling	✓ Vehicle maintenance and equipment handling to be carried out in areas especially equipped for this purpose in order to prevent spillage and contamination.	Not applicable	Contractor	During construction	Low	The impact should be completely mitigated or reduced form posing danger to the environment.

		✓ All oil changes, lubrication and maintenance will take place only at the designated areas. ✓ Refueling of vehicles will and must take place at the designated refueling area. This area will have a sufficiently impermeable surface to prevent seepage into ground water. The refueling area will be bounded to prevent any surface water from running over this area.					

12.	Vehicle and equipment washing	✓ Washing of vehicles and equipment should be done in one place and if ever spillages of detergents occur then cleaning up should be considered immediately	Not applicable	Site workers	During construction	Low or completely mitigated	If the washing of vehicles and equipment is done in an appropriate manner and detergents are always sealed then the negative impact would be low or no more.
13.	Labour force	✓ Laborers to be restricted to construction area. ✓ Access to the site should be restricted to employees of the contractor. ✓ Temporary ablution facilities to be provided at	If local labour is used, the local community will benefit.	Contractor to identify suitable areas for the said facilities. Contractor to maintain the above facilities.	During construction	Not applicable	Skills and knowledge should be gained by these employees who assist in building local communities.

		appropriate sites (one toilet for 14 laborers). ✓ Such ablution facilities to be kept away from natural water bodies. ✓ Cooking facilities to be provided in demarcated areas. ✓ All informal traders to be discouraged. ✓ All labor will undergo basic induction, where safety, health and environmentally issues will be discussed.					

		✓ Construction staff should be educated, prior to commencement of construction, as to the need to refrain from destruction or killing of animals and plants, as well as from indiscriminate defecation, waste disposal and / or pollution of local soil and water sources. ✓ The contractor should ensure proper supervision of employees at all times.					

14.	Temporary jobs	✓ Local labor and contractors must be used wherever possible. Basic skills development and capacity development must be incorporated with this. It will be a specific condition in the contractors' agreements that local labor be used wherever possible. All reasonable attempts will be made to appoint people from the local communities as	Not applicable	Contractor	During construction	Low	Local laborers should be given priorities.

		temporary laborers for non- specialize tasks and they will be subject to the necessary basic skills training.					
15.	Security and crime	✓ Members of the community should be hired to patrol the premises during construction and maintenance. ✓ The access of unauthorized individuals must be minimized.	Safety on site will be enhanced	Contractor	During construction and maintenance	Low	Crime could be reduced or completely eradicated by the improvement of security system.
16.	Fire preventi	✓ Contractor must make sure that there is supervision for all	Not applicable	Contractor	During construction	Low	Every public structure has to have fire prevention measures in place

	on and control	fires that are used in the construction camp. ✓ Smoking should be prohibited in the vicinity of flammable substances. ✓ The contractor should ensure that fire-fighting equipment is available on site, in particular where flammable substances are stored. ✓ Fires started for comfort(warmth) should be					the presence of this facility is a necessity.

		discouraged by the contractor, due to the risk of vegetation fires and risk to adjacent property ✓ Fire-fighting equipment and emergency plans must be in place prior to the construction phase. ✓ The contractor will plan and implement a fire prevention programs and develop a contingency plan in the event of any fire.					

		✓ No refuse or waste may be burn. ✓ The contractor will be responsible for all damages caused by the outbreak of a fire originating from a site where work is undertaken. Damage to adjacent properties will be to his account. ✓ The contractor is to provide cooking areas where fire risks will be minimized and controllable.					

17.	Safety and access control	✓ Safety equipment must be provided to all employees to prevent personal injury during construction activities. This includes equipment such as protective eye and ear wear and protective clothing where necessary. ✓ Staff should be appropriately trained in all assigned activities. ✓ Access to dangerous excavations and materials, must be	Safety on site will be enhanced	Contractor	During construction	Low	Safety and Access control will be management according to the requirement.

		controlled by the site manager. ✓ All personnel and vehicles used for transportation and/or construction purposes should remain within these demarcated areas. ✓ Excavations should only remain open of a minimum period of time and during this time the must be clearly demarcated so as to prevent accidental ingress of people and animals.					

18.	Material handling	✓ Re-fueling and maintenance of vehicles must take place off site. ✓ No oils, chemicals or other hazardous materials used during construction are to be stored on site.	Not applicable	Contractor and site workers	During construction	Not applicable	If employees will be properly trained to handle material this could avoid any incidents from occurring.
19.	Survey points	✓ Roads or trails that are cut to provide temporary access for survey work must be minimized. ✓ Vegetation clearing must be kept to a minimum during survey operations.	Not applicable	Contractor	During construction	Low	Construction will only take place on the proposed or demarcated area.

20.	Construction camp	✓ The choice of the site for the contractors' camp requires the Engineers permission and must take into account location of villagers and or ecological sensitive areas, including flood zones and unstable zones. ✓ The size of the construction camp should be kept to a minimum. ✓ The contractor must attend to the drainage of the camp to avoid	Not applicable	Contractor and engineers	During construction	Low	The site will be accessible and pose less impact on the environment if chosen in a correct place. The engineers should be responsible to ensure that the chosen place has less or no environmental impact.

		standing water and or sheet erosion.					
21.	Workers conduct on site	✓ A general regard for the social and ecological well-being of the site and adjacent areas is expected of the site staff. ✓ Workers need to be aware of the following general rules: ✓ No alcohol / drugs to be present on site. ✓ No firearms are allowed on site or in vehicles transporting staff to or from the	Not applicable	Contractor	During construction	Not applicable	Workers will be provided sufficient SHERQ awareness training.

		site (Unless used by the security personnel). ✓ Prevent excessive noise. ✓ No harvesting of firewood from the site or from the areas adjacent to it. ✓ Other than per-approved security staff, no workers shall be permitted to live on site.					

Operation and maintenance phase

The table below indicates the identified impacts and mitigation measures that could occur during operational and maintenance phases.

No.	Impact	Responsible person	Timeframe
1.	Storm water management: ✓ It is recommended that proper storm water drainage system be ensured during operation and maintenance phase. ✓ Storm water should not be allowed to discharge onto bare soil but must be diverted to the surrounding grasslands or to the landscaped gardens during the operational phase.	Operator	During operation and maintenance
2.	Clean-up action: ✓ In the event of incident or leakage of hazardous waste from storage site, a professional company to be appointed to remove and cleanup the waste as quickly as possible.	Operator and contractor	During both construction, operation and maintenance phases
3.	Waste generation and disposal: ✓ Solid waste generated during operation and maintenance phase must be removed in a continuous and efficient manner to the satisfaction of the local municipality. ✓ A waste management plan to be developed and maintained for the construction site.	Operator and contractor	During construction, operation and maintenance

	✓ No solid waste should be dumped on the site. ✓ All domestic waste generated on the site should be disposed of in a proper manner off site i.e. no burial on site.		
4.	Maintaining environmental complaint register: ✓ The environmental complaint register must be maintained during the operation and maintenance phase.	Operator	Operation and maintenance
5.	Maintenance of access roads: ✓ Access/ alternate roads to be maintained with an acceptable free of erosion, and no surface water ponding.	Operator	Operation and maintenance
6.	Traffic: ✓ Any traffic disruptions due to the movement of heavy machinery should be undertaken with the approval of all relevant authorities and in accordance with all relevant legislation.	Local municipality	

APPENDIX G: ENVIRONMENTAL MANAGEMENT PROGRAMME (EMPR)

ENVIRONMENTAL MANAGEMENT PROGRAMME (EMPR)

FOR THE PROPOSED TOWNSHIP ESTABLISHMENT ON PORTION OF FARM KLIPFONTEIN 716 AND FARM CERES 626 WITHIN THE MANGAUNG METROPOLITAN MUNICIPALITY

DESTEA EMS/15/20/01 AND FSP/EIA/0000339/2020

JULY 2020

Prepared For:

Department of Economic Small Business Development, Tourism and Environment Affairs (DESTEA).

Prepared By:

Inaluk Consulting Services

Report Tittle : Draft Environmental Management Programme for the Proposed Mangaung Township

Place and Date : Pretoria July 2020

PROPONENT

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DECLARATION OF INDEPENDENCE
I, Kulani Nkuna as authorised representative of Inaluk Consulting Services hereby confirm my independence as an Environmental Assessment Practitioner and declare that neither I nor Inaluk Consulting Services have any interest, be it business, financial, personal or other, in any proposed activity, application or appeal in respect of which Inaluk Consulting Services was appointed as Environmental Assessment Practitioner in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998), other than fair remuneration for worked performed, specifically in connection with the Environmental Authorisation process for the Ladysmith Township extension 61.

Signature……  **……. Date……17 July 2020…….**

Contents

List of Tables

1. EXECUTIVE SUMMARY

Mangaung Metropolitan Municipality appointed Ngoti Development Consultants for town planning services for the proposed township establishment. Inaluk Consulting Service was appointed by Mangaung Metropolitan Municipality as an Independent Environmental Assessment Practitioner (EAP), to compile an Environmental Management Programme Report (EMPr) for the proposed Township (mixed-use) development within the Mangaung Metropolitan Municipality in the Free State Province.

Based on chapter 2, section 24 of the Constitution of the Republic of South Africa "everyone a right to an environment which is not harmful to their health or wellbeing and to have their environment protected for the benefit of present and the future generations, through reasonable legislative and other measures that prevent pollution and ecological degradation, promote conservation and the sustainable use of natural resources while promoting justifiable economic and social development". The purpose of this EMPr is to serve as a framework that can be used in order to ensure that negative environmental impacts are dealt with in a safe and professional manner throughout the lifecycle of the project's construction phase. This could only be done by applying relevant environmental Acts and Regulations. This EMPr must be considered throughout the lifecycle of the proposed development's construction activities and mitigation and management measures outlined in this document must be applied accordingly.

2. INTRODUCTION

This EMPr describes the methodology for the management, monitoring and rehabilitation of potential negative impacts and maximization of positive impacts of the township development. The Contractor/developer, Environmental Control Officer (ECO), the site Manager and any person who will be taking part in the activities of the proposed development must use the EMPr as a guideline in order to avoid, minimise and manage adverse environmental impacts and effects associated with the development.

The EMPr provides specifications and regulations that must in all instances be adhered to. It is the responsibility of everyone who is involved in this project to have a commitment at all costs with the implementation of the EMPr. The main contractor shall receive a copy of the EMPr from the proponent and the engineer on which he will be given the opportunity to clear any misconceptions and uncertainties. The EMPr should form part of the contract and will therefore be a legally binding document for the development of the township. In the event of any discrepancies with regard to environmental matters or environmental specifications this document shall take precedence.

The primary objectives of the EMPr are as follows:

•To indicate responsibilities, schedules and staff resources regarding the implementation of this document

•To describe action plans for achieving the mitigation measures

•To describe a monitoring programme, this enables the review of the EMPr success and the provision of such information to the relevant decision-makers.

3. OBJECTIVES OF EMPR

A set of environmental management measures for implementation during the construction phase of the project has been prepared to meet the following overall environmental management objectives:

•Minimize disturbance to indigenous plant species;

•Prevent and or reduce possible soil erosion;

•Minimizing disturbances to the local community (social impacts);

•Reducing negative visual aspects during the construction phase; and to

•Prevent and or minimize air and noise pollution; and to

•To avoid loss or damage to archaeological resources (should they be uncovered during construction).

4. LEGAL REQUIREMENT

This EMPr has been developed to serve as an environmental guiding tool during construction activities. The contractor must take note that conditions as stated in this EMPr are legally binding in terms of the environmental statutory legislation. A hard copy of the EMPr must be kept on site during construction. Two hard copies will be kept at the Local Community Councils when the development is occupied, operational and in the maintenance phase.

National Fire Protection Association (NFPA) standards
International Standards Organization (ISO) 9000/2000 Quality Systems
South African standards, codes and regulations, which include:
Occupational Health and Safety Act (OHASA) Act 85 of 1993

South African National Standard (SANS) 10089 (pertaining to the building industry)

National Environmental Management Act, Act 107 of 1998

Environmental Conservation Act, 1989 (Act No 73 of 1989) (ECA)

National Water Act, 1998 (Act No.36 of 1998)

Constitution of South Africa 1996 (Act No. 108 of 1996)

National Heritage Resources Act 1999 (Act No 25 of 1999)

Protected species – provincial ordinances

Conservation of Agricultural Resources Act (Act No 103 of 1997)

National Environmental Management: Biodiversity Act (Act No. 10 of 2004)

National Environmental Management: Air Quality Act (Act No. 39 of 2004)

Atmospheric Pollution Prevention Act (Act No. 45 of 1965)

Hazardous Substances Act, 1973 (Act No. 15 of 1973).

The most important legislative Act is the National Environmental Management Act (Act No. 107 of 1998). NEMA is an overarching environmental legislation and it provides a framework for environmental law reform and covers the following:

•Land, planning and development

•Natural and cultural resources, use and conservation

•Pollution control and waste management.

Based on section 28 (1) of the National Environmental Management Act (Act No. 107 of 1998):

“Every person who causes, has caused or may cause significant pollution or degradation of the environment must take reasonable measures to prevent such pollution or degradation from occurring, continuing or recurring, or, in so far as such harm to the environment is authorized by law or cannot reasonably be avoided

or stopped, to minimize and rectify such pollution or degradation of the environment''

5. SITE DESCRIPRTION AND LOCATION

The proposed mixed-use development falls under the Mangaung Metropolitan Municipality, Free State Province.

The proposed development footprint is located across the road from an already established township area (near Kopanong) and approximately 193 ha in surface size, situated within the Mangaung Metropolitan Municipality, Free State Province. The site is situated partly adjacent to Dewetsdorp Road and the M30, approximately 17 km outside Bloemfontein central with the following coordinates: 29° 12' 55.95" S and 26° 15' 51.58" E. The proposed footprint is situated on a Portion of the Farm Klipfontein 716 and Farm Ceres 626.

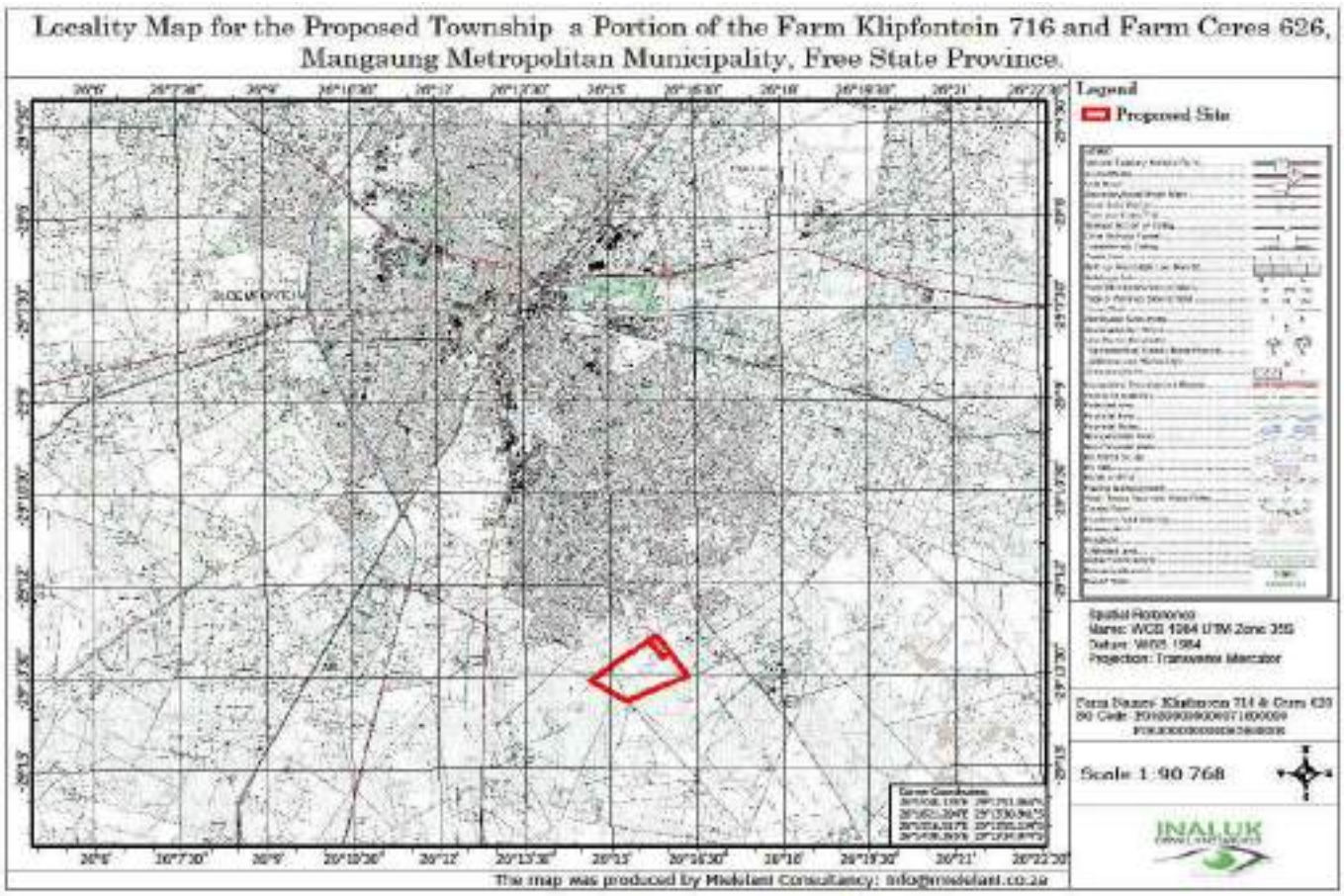

Figure 1: Locality Map

6. DESCRIPTION OF RECEIVING ENVIRONMENT

6.1. Vegetation:

The study area and project site is situated within the Grassland Biome and Dry Highveld Grassland bioregion. The proposed project area forms part of the (Gh5) Bloemfontein Dry Grassland vegetation type (Mucina & Rutherford, 2006).

The proposed footprint forms part of an area classified by the Critical Biodiversity Area map of the Free State Province as partly 'Degraded' and partly 'Other natural areas'. The vegetation present on site is not typically representative of the Bloemfontein Dry Grassland vegetation type, although some areas (small parts) appears to show signs of the natural vegetation type representation. The vegetation as found on site are dominated by grasses while indigenous, non-indigenous and alien invasive species occur in the proposed footprint.

Table 1: Conservation status of the vegetation type occurring in and around the study area

Vegetation Type	Target (%)	Conserved (%)	Transformed (%)	Conservation Status
				Driver et al., 2005; Mucina & Rutherford, 2006
Bloemfontein Dry Grassland	24%	Small portion	40%	Endangered

6.2. Climate:

The project area normally receives about 450mm of rain per year, with most rainfall occurring mainly during summer. It receives the lowest rainfall in July and the highest in March. The mean annual temperature (MAT) of the region is approximately 15.7° C. The region is the coldest during July with high incidence of frost in the winter.

6.3. Topography and Drainage:

The proposed site for the township is located in quaternary catchment C52F. The general flow of water on site will be in a north eastern direction, when evaluating the positions of the dam walls and site topography. The topography found at the proposed construction area is relatively flat. As this is a large area, slopes occur towards various directions, however, the overall slope tends towards the north eastern direction.

7. ENVIRONMENTAL MITIGATION AND MANAGEMENT MEASURES

These guidelines will form the basis for environmental mitigation and management on site. The appointed Environmental Control Officer (ECO) will ensure that any modifications are communicated, explained to and discussed with all the

Interested and Affected Parties (i.e. the authorities, contractor, the proponent and any directly affected party who requests this information).

- Mitigation of the potential impact in regard to the
  - Potential to mitigate any negative impacts
  - Potential to optimize any positive impacts
  - The likelihood of successful mitigation

- Overall assessment and general comments as to the predicted impacts of the development after mitigation in terms of such criteria as may be relevant to a particular impact, and which may include the following aspects :

  - The severity and permanence of the impact on either local biota or surrounding human communities
  - The size of the affected communities and their relative significance
  - The general ecological and socio – economic context within which a particular impact would occur
  - The final balance of between positive and negative impacts, and related costs and benefits to society.

Pre-construction and construction phases

Establishment of environmental governing bodies

- **Establishment of Environmental Monitoring Committee (EMC)**

An Environmental Monitoring Committee needs to be established with representatives of I&APs, relevant authorities and the holder of an Environmental Authorization. The role of this EMC is to monitor the environmental compliance during all phases of the project and satisfy as far as possible the issues and concerns of all parties involved in or affected by the project.

- **Appointment of Environmental Control Officer (ECO)**

An Environmental Control Officer will fulfil the responsibility of assuring that environmental performance is achieved by the developer and its contractors during all phases of the project. It is the responsibility of the ECO to audit compliance with the commitments set out in this EMP, and assist with the implementation of mitigation measures. The contractor and / the clients representative (ECO) will inspect all the construction activities on a monthly basis. All issues highlighted in this Environmental Management Plan will be investigated and compliance with the mitigation measures audited. Preceding complaints, concerns or incidents reported in the logbook will also be monitored.

Feedback of the findings, changes to this document as well as all reported incidents will be reported at the monthly progress meetings between the Consulting Engineer, Contractor and Client Representative. A summary of these reports will also be forwarded to the Free State Department of Economic Small Business Development, Tourism and Environment Affairs (DESTEA), and the measures to rectify the issue stated. Any previous findings must be audited to confirm the successful implementation thereof. At the end of the project a summary document will be prepared and presented to the Department of Economic Small Business Development, Tourism and Environment Affairs (DESTEA).

Establishment of complaints register

A complaints register is to be established and kept onsite to address complaints in a timorous fashion, which will be reported to the EMC.

Responsibilities and timeframes for the pre-construction phase

Number	Establishment of Environmental Governing Bodies	Responsibility	Timeframe
1.	**Establishment of Environmental Monitoring Committee (EMC):**	Environmental consultant(s)/specialist(s)	During the lifetime of the project (from pre-construction through

	Establish an Environmental Monitoring Committee with I&APs' representatives. Formal agreement regarding the frequency of meetings and agenda must be reached.		operation and maintenance phases).
2.	**Appointment of Environmental Control Officer (ECO):** Developer to appoint the ECO for the project.	Developer	Pre-construction, construction and operation and maintenance phases.
3.	**Establishment of a complaints register:** Environmental complaint register to be maintained: ✓ All complaints with regards to environmental non-compliance on the construction site need to be recorded and addressed accordingly. ✓ Establish an Environmental complaints register. ✓ Address complaints timorously and report back to EMC meetings. ✓ Open liaison channels should be identified and developed to ensure that all queries, complaints from affected individuals/ parties may be addressed with the shortest possible delay.	Site engineer and contracts managers will be responsible for maintaining the register and report any complaints received to the ECO	During construction, operation and maintenance phases

Assessment Approach to environmental issues during the construction phase

The assessment and description of identified environmental issues were conducted according to the structure and approach detailed below. The following is a brief description of how these impacts were identified and rated. The approach

may be tailored and altered where required to deal adequately with the description and assessment of a specific impact.

A description of the nature of the potential issues as to its:

- General background and context within this application
- Causes and effect
- Who or what will be affected
- How it will be affected

Assessment of the impact as to:

- Probability
- Duration
- Extent
- Reversibility
- Magnitude

The table below shows how each impact was assessed and is an elaboration of the approach used in identifying rate these impacts.

Potential issue	**Criteria**	**Description of elements that are central to each issue**
Description	Nature	What causes the effect?
		Who will be affected?
		What will be affected?
		How will it be affected?
	Probability	Certain / may not occur with mitigation.
	Status	Positive (beneficial impact); negative (deleterious or adverse impact); or neutral (impacts is either beneficial or diverse).
Assessment	Extent	Is the impact site specific?

		Does the impact extend locally, i.e. to the site and its nearby surroundings?
		Does the impact extend regionally, i.e. have an impact on the region.
		Does the impact extend nationally, i.e. have an impact on a national scale.
	Duration	Short term, i.e. 0-5 years.
		Medium term i.e. 5-11 years.
		Long term, i.e. impact ceases after the construction or operational life cycle.
		Permanent, i.e. mitigation either by natural process or by human intervention will not occur in such a way or in such a time span that the impact can be considered transient.
	Magnitude	Low, i.e. natural and social functions and processes are not affected or minimally affected.
		Medium, i.e. affected environment is notably altered. Natural and social functions and processes continue albeit in a modified way.
		High, i.e. natural or social functions or processes could be substantially affected or altered to the extent that they could temporarily or permanently cease.
	Reversibility	Impact is reversible or irreversible.
	Cumulative or non-cumulative	Potential of two or more impacts to combine to form cumulative or synergistic impacts.

Identified Impacts for the construction of the township development

No.	Impact	Description		Assessment					
		Nature	***Probability***	***Status***	***Extent***	***Duration***	***Magnitude***	***Reversibility***	***Cumulative/ Non-cumulative***
1	**Noise**: It is expected that the construction activities will cause noise pollution in the area during working hours.	The current site is a vegetation land surrounded by residential area and the noise is expected to be not higher than the allowable ambient noise limit.	The probability of change is certain with regard to the potential sources of noise pollution during construction phase.	An increase in noise pollution would be a negative impact to the surrounding environment.	The impact would be site specific and in the local environment.	During construction phase due to construction vehicles and machinery.	Medium.	Reversible, after completion of the construction the noise level will return to the initial state.	Cumulative, an increase in noise due to construction activity or vehicles.
2	**Dust:** The creation of dust would be evident in the	The current site is vacant and open space. Dust pollution at site is at	During construction period the dust level could rise as a result of heavy construction	An increase in dust would be a negative impact to the surrounding environment.	The impact would be site specific and in the local	The impact would only result during the	Medium.	Reversible, after completion of the construction the dust level will be	Non-cumulative

No.	Impact	Description		Assessment					
	area during construction	moderate level. Increase of dust level during construction phase could have an impact to the air quality.	vehicles movement and the construction itself.		environment.	construction phase		lower than the initial state.	
3	**Soil erosion**: The construction activities for the development of the township have the potential to create soil erosion.	The current environmental site is an open space evidenced with grazing of cattle and donkeys.	The probability of change is uncertain during construction phase.	The current site infrastructure designs does cater for the Storm Water Management. If it is not addressed in the proposed development it could increase the impact.	The impact would be site specific.	Might occur only during construction phase. Short term.	Medium. The surrounding might be negatively affected.	Reversible, when the construction is completed, the storm water management in the area is improved, intern soil erosion issue could be addressed.	Non-cumulative. If the proposed development design addresses the storm water management issue.

No.	Impact	Description		Assessment					
4	**Waste disposal:** Uncontrolled and random disposal of waste has a negative effect on the health status of the local environment.	The existing current site is affected by poor waste disposal on some parts of the proposed site.	The probability of change is uncertain.	An increase in waste and improper disposal might result in an encouragement of illegal dumping site establishment that could later pose serious environmental health hazard to the environment.	Impact would be site specific and in the local environment.	Only during construction phase. Short term.	Medium.	If well managed, it can be reversed or even avoided.	Non-cumulative.
5	**Mixing of concrete:** Concrete residue when left to harden can create areas which can be difficult to	The current site is free from concrete slabs, proper measures need to be implemented to avoid adverse impacts.	The probability of change is uncertain which may rise as a result of dry concrete mixture left during construction.	If concrete mixing is not well managed and left to dry it may result into concrete slab formation or negatively impact to the surrounding.	Impact would be site specific and in the local environment.	This might permanently affect the soil.	Medium. The soil character might be changed.	Reversible.	Non-cumulative.

No.	Impact	Description		Assessment					
	remove or rehabilitate.								
6	**Waste generation and disposal:** Waste generation and inappropriate disposal could lead to wide array of environmental problems i.e. soil, surface contamination…	The current state of the site is affected by illegal waste disposal.	The probability of change is uncertain.	Generated waste and disposal method could be sources of pollution.	Impacts could be site specific and in the local environment.	If waste management plans are not in place this could be a long term effect.	High.	If well managed, it can be reversible.	Cumulative.
7	**Hazardous waste:** Various hazardous materials,	The current state of the site is free from toxic chemicals.	The probability of change is uncertain depending on the management.	Hazardous substances if not managed or used in an appropriate	Impacts would be site specific and could	Short term if early managed.	High.	If well managed can be reversible.	Cumulative

No.	Impact	Description		Assessment					
	construction waste and by-products as thinners and oils used during construction could become sources of pollution if not disposed of in an appropriate manner.			manner can be sources of pollution.	extend to regional environment.				
9	**Endemic flora and fauna:** Endemic flora and fauna in and around the construction site should be protected as	The site is an undisturbed land, disturbance to the vegetation is expected during the construction.	The probability of change is certain.	The current state of the site pose impact to flora and fauna during vegetation clearance (this can be minimal)	The impact could be site specific and in the local environment.	Permanent.	Low.	It could be reversible or rehabilitated.	Cumulative.

No.	Impact	Description		Assessment					
	much as possible.								
10	**Storm water runoff:** Uncontrolled storm water runoff could create various problems such as soil erosion.	A wetland exist on the targeted site, poor storm water management could lead to the wetland accumulating the waste water.	The probability of change is certain.	If storm water is not properly managed, during rainy season water could be stagnant or erode soil and that could also lead to the environment being unhygienic.	The impacts would be site specific and in the local environment.	Short term.	Low.	Not applicable.	Non-cumulative.
11	**Storage of equipment and materials:** Equipment and materials if not stored in an appropriate manner could be	Materials and equipment storage should be done properly to eliminate injuries and accidents.	The probability of change is uncertain.	Equipment and materials if not stored in an appropriate manner could be sources of pollution.	Impacts would be site specific and in the local environment.	Short term.	Low.	If well managed it can be reversible	Non-cumulative.

No.	Impact	Description		Assessment					
	a source of pollution.								
12	**Vehicle maintenance and refueling:** Spillages of hazardous liquids such as fuel, engine oil and other liquids used during vehicle maintenance and equipment handling on the ground surface could result into contamination of soil, surface	Looking at the magnitude of the project, a lot of mobile equipment are expected.	The probability of change is uncertain.	Oil/Hydrocarbons spillages would be a negative impact to the current environment.	Impacts would be site specific and in the regional environment. As a results of the highly soluble rock type of the area.	Short term.	Medium.	Could be reversible when construction is completed.	Could be cumulative. Soil characteristic could change and species and plant could be destroyed in the area.

No.	Impact	Description		Assessment					
	water and ground water.								
13	**Vehicle and Equipment washing:** Spillages of washing detergents and wash water containing detergents and oils could impact the environment negatively.	The site is not contaminated by any spillage of washing detergents or oil.	The probability of change is uncertain.	An increase in washing detergents would have a negative impact. This has to be avoided.	Impacts would be site specific	Short term if well managed	High.	If appropriately managed it could be reversed.	Non-cumulative.
14	**Labour force:** Environmentally unfriendly actions and lack	The targeted site is situated amongst residential,	The probability of change is uncertain.	The current local communities is faced with high unemployment rate,	Impacts would be site specific and in the	Permanent.	Not applicable.	Permanent.	Not applicable.

No.	Impact	Description		Assessment					
	of good social behavior of the Labour force can create various problems (i.e. as crime, pollution.)	agricultural areas and accessed by near-by locals.		the proposed project will create several jobs within community.	local community.				
15	**Temporary Jobs:** It is important to use local labour where possible and comply with the public requirement for the proposed development.	A place/site where development is to be located, job seekers are always around the area for an employment.	The probability of change is uncertain	Unemployment is a negative effect in and around the local community. Not employing the local labours could impact the project negatively.	Impacts could be site specific and in the local community however could extend to national.	Permanent.	Not applicable.	Not applicable.	Not applicable.

No.	Impact	Description		Assessment					
16	**Security and Crime:** Security on the construction site needs to be maintained. Construction work and related activities are usually associated with an increase in criminal incidents in the area where development occurs.	Vacant land at this stage of reporting	The probability of change is uncertain.	Vacant land at this stage of reporting	The impacts could be site specific and in the local community. However it could extend	Permanent.	Medium.	Low.	Non-cumulative
17	**Fire prevention and control:** The activities	The site currently does not have any	The probability of change is uncertain.	The presence of construction	Impacts could be site specific	Short term.	Medium.	Low.	Cumulative.

No.	Impact	Description		Assessment					
	that take place in the contractor's camp may pose a threat of the creation of fires. Therefore appropriate measures are to be taken.	activities that may pose fire threats except out of natural course.		operation could pose fire hazards.	and in the local environment				
18	**Safety and access control:** Sufficient safety measures should be taken to avoid unnecessary accidents and/or injuries.	Safety in areas of high unemployment rate is always a concern.	The probability of change is certain.	Safety is currently a big concern to the community members as they are affected by crime. The construction could be affected by criminal elements which would in turn increase crime	Impacts would be site specific and in the local environment.	Short term.	Medium.	Non reversible.	Non-cumulative But could cumulate if not managed.

No.	Impact	Description		Assessment					
				statistics in the area.					
19	**Material handling:** Handling of materials such as fuels, grease and oils must be supervised daily on a continuous basis.	The site is currently without material such as fuels, grease storages.	The probability of change is certain during construction period.	The hydrocarbon materials if not stored in an appropriate manner can be sources of pollution.	Impacts would be site specific and also extend to regional environment.	Short term if not managed well.	Low, if well managed.	Reversible if well managed.	Non-cumulative.
20	**Survey points:** The surrounding environment must be taken into consideration when survey	The site boundaries are given and need to be clearly pegged.	The probability of change is certain.	If boundaries are not clearly demarcated, construction activity can have impact on neighboring site.	Impacts would be site specific and in the local environment.	Short term.	Low.	Reversible.	Non-cumulative.

No.	Impact	Description		Assessment					
	operations are to be performed.								
21	**Construction camp**: The choice of site for the contractors' camp requires the Environmental Control Officer and Engineers permission, and must take into account location of local villagers and or ecological sensitive areas.	Location of site camps is significant, To avoid unnecessary negative impacts	The probability of change is uncertain.	Construction camps are associated with environmental impacts, if not properly selected and managed.	Impacts would be site specific and in the local environment.	Medium term.	Medium.	Irreversible.	Non-cumulative.

No.	Impact	Description		Assessment					
22	**Workers conduct on site:** A general regard for the social and ecological well-being of the site and adjacent areas is expected of the site staff. The presence of construction employees in the area could impact negatively to the social life of the local community.	The site is currently not used.	The probability of change is uncertain depending on the workers behavior.	Workers conduct could have a negative impact on the surrounding neighbors.	Impacts would be site specific and in the local environment.	The duration of the impact is project term related.	Low.	Reversible.	Non-cumulative

No.	Impact	Description		Assessment					
23	**Palaeontology**	The site is currently not used.	There is a high chance of fossils find during the construction phase of the development as the location of proposed development is on a high sensitivity map	Excavation work may expose fossil remains during any phase of the construction activity If fossil remains are discovered during any phase of construction, either on the surface or exposed by excavations the **Chance Find Protocol** must be implemented by the Environmental Control Officer (ECO) in charge of these developments	Site	Construction phase	Low	Irreversable	Negligible cumulative impact

Proposed mitigation and management

<table>
<tr><th>Mitigation</th><th>Impact and proposed mitigation and management actions</th><th>Responsibility</th><th>Timeframe</th></tr>
<tr><td>Potential to mitigation negative impact</td><td rowspan="2">Description of mitigation measures. Extent to which mitigation measures could influence the significance and status of impact.

Where ever possible a description of the optimization measures. Extent to which they could influence the significance of impact.</td><td rowspan="2">The responsible person to ensure that the mitigation measures are taken</td><td rowspan="2">Implementation period for the mitigation</td></tr>
<tr><td>Potential to enhance positive impacts</td></tr>
<tr><td rowspan="3">Significant rating of impact after mitigation</td><td colspan="3">Low, i.e. natural and social functions and processes are not affected or minimally affected.</td></tr>
<tr><td colspan="3">Medium, i.e. affected environment is notably altered. Natural and social functions and processes continue albeit in a modified way.</td></tr>
<tr><td colspan="3">High, i.e. natural or social functions or processes could be substantially affected or altered to the extent that they could temporarily or permanently cease.</td></tr>
<tr><td>Comment on the overall assessment and conclusion.</td><td colspan="3">Overall Assessment and concluding comments as to the predicted impacts after mitigation and their:
✓ Severity and permanence
✓ Size and relative significance
✓ Ecological and socio – economic context
✓ Balance between positive and negative aspect
✓ Cost and benefits
✓ Acceptability / Unacceptability</td></tr>
</table>

No.	Impact	Mitigation		Responsibility	Timeframe	Significant rating of impact after mitigation	Comment on the overall assessment and conclusion
		Potential to mitigate negative impacts	Potential to mitigate positive impacts				
1.	Noise	✓ Construction and other noise generating activities should be restricted to between 06h00 and 18h00 Monday to Friday, unless otherwise approved by the appropriate competent person in consultation with adjacent landowners/affected persons and ECO. ✓ During the operational phase all activities must take place in a manner	Not applicable	Contractor	During construction	Low	If construction vehicles are serviced and properly maintained the level of noise should be less.

		that will allow as little noise as possible. ✓ Activities, which are deemed to generate high levels of noise, will be restricted to normal working hours.					
2.	Dust	✓ The liberation of dust into the surrounding environment shall be effectively controlled by the use of, water spraying. ✓ The speed of haul trucks and other vehicles must be strictly being controlled to avoid dangerous conditions, excessive dust or deterioration of the road being used. ✓ Site clearance to be done only as needed in phases.	Not applicable	Contractor	During construction	Low	The level of dust should be reduced to minimal as the result of water spraying during working hours and pilling of soil should be avoided where ever possible.

3.	Soil erosion	✓ Submission of an operational plan for the construction phase indicating technical and management measures to prevent soil erosion. ✓ Stock piled topsoil should not be compacted and should be replaced as final soil layer. ✓ Soil should be exposed for the minimum time possible once cleared of vegetation, i.e. the timing of clearing and grubbing should be co-ordinate as much as possible to avoid prolonged exposure of soils to wind and water erosion. ✓ The A-horizon will be removed and used for rehabilitation purposes.	Not application	Contractor	During construction phase	Low	The design lay out plan should address all issues relating to storm water management and soil erosion. This could be a complete mitigation of this soil erosion.

		The lower soil horizons will be used for construction activities. The A-horizon will be stockpiled in a responsible manner and replaced during rehabilitation.					
4.	Waste generation and disposal	✓ A waste management plan to be developed for the construction site. ✓ Plan to ensure that all waste is contained in suitable containers to prevent waste being washed into water bodies. ✓ Containers for waste to ensure that any fluids generated by waste are trapped and can be disposed of in a suitable.	Not application	Contractor	During construction	Low	Waste removal should be done regularly and that could make the environment free from any hazards. This could completely mitigate this impact.

5.	Mixing of concrete	✓ Where concrete has been mixed, especially in the natural environment, all residues must be removed and disposed of in an environmentally responsible manner approved by the ECO.	Not applicable	Contractor	During construction	Low	Unused cement should not be left to dry on the ground. If proper housekeeping rules are complied with, most impacts should not affect the environment.
6.	Sewage disposal	✓ The contractor to install adequate portable chemical toilets to meet the sanitation needs on the construction site (14 people per toilet).	Not applicable	contractor	During construction and maintenance	Low or completely mitigated	Ablution facility should be made available during construction phase for the employee to able to use this facility. All type of waste should be classified and disposed in an appropriate registered waste disposal site.
7.	Hazardous substances	✓ Hazardous materials to be stored correctly, marked, labelled, without the risk of contamination and hazardous waste to be disposed of correctly with	Non-applicable	Contractor in co-operation with the ECO	During construction	Low	Employees dealing with hazardous substances should be trained and be competent to do so. This could completely mitigate reduce the risk posed by this impact.

		the necessary certificates issued. ✓ All oils, hydraulic fluids and other hazardous materials will be stored in suitable containers in a structure or facility designated for this purpose. ✓ Material Safety Data Sheets (MSDSs) shall be readily available on site for all chemicals and hazardous substances to be used on site. ✓ Storage areas containing hazardous substances must be clearly signed and the designated person contact and names should be displayed. ✓ Residents living adjacent to the construction site					

		must be notified of the existence of the hazardous storage area. ✓ Staff dealing with these materials/substances must be aware of their potential impacts and follow the appropriate safety measures.					
8.	Endemic flora and fauna	✓ No endemic flora and fauna species will be deliberately destroyed or permanent alienated from their natural habitat during construction. ✓ Excavations left open during construction should be checked periodically such that animals falling in can be safely removed and released away from construction activities. All	Not applicable	Contractor and ECO	During construction	Low	Identified indigenous plants and species existing in the area will be protected by all means.

		excavations should be filled as soon as possible. ✓ Construction staff should be advised not to chase, kill or catch animals found or encountered during construction. ✓ Only vegetation falling in directly in demarcated in operational area should be removed where necessary. ✓ No exotic/invasive plants are to be planted on common ground of the site. ✓ No vegetation will be removed without prior permission from ECO.					
9.	Storm water runoff	✓ To prevent storm water damage, the increase in storm water run-off resulting from	Not applicable	contractor	During construction	Low	This should be able to address soil erosion as well as the design of the site should have appropriate storm water management as well

		construction activities must be estimated and the drainage systems assessed accordingly. ✓ A drainage plan must be submitted to the Engineer for approval and must include the location and design criteria of any temporary stream crossing. ✓ All storm water runoff from compacted materials must be monitored if signs of erosion become apparent.					as drainage system that should have oil trap/ filters if necessary.
10.	Storage of equipment and materials	✓ Choice of location for storage areas must take into account prevailing winds, exposure sun, distance to water bodies and	Not applicable	Contractor	Throughout the lifecycle of a project	Low	If employees on site shall practice good housekeeping behavior, the work condition will be free of injuries and everything would be in its place and there will be space for everything.

		general onsite topology. ✓ All equipment and materials must be stored in a designated area in an appropriate manner as to prevent pollution. ✓ Storage areas must be designated, demarcated and fenced as effective as possible. ✓ Fire prevention facilities must be present and accessible at all times.					
11.	Vehicle maintenance and refueling	✓ Vehicle maintenance and equipment handling to be carried out in areas especially equipped for this purpose in order to	Not applicable	Contractor	During construction	Low	The impact should be completely mitigated or reduced form posing danger to the environment.

		prevent spillage and contamination. ✓ All oil changes, lubrication and maintenance will take place only at the designated areas. ✓ Refueling of vehicles will and must take place at the designated refueling area. This area will have a sufficiently impermeable surface to prevent seepage into ground water. The refueling area will be bounded to prevent any surface water from running over this area.					
12.	Vehicle and equipment washing	✓ Washing of vehicles and equipment should be done in one place and if ever spillages of detergents occur then cleaning up	Not applicable	Site workers	During construction	Low or completely mitigated	If the washing of vehicles and equipment is done in an appropriate manner and detergents are always sealed then the negative impact would be low or no more.

		should be considered immediately					
13.	Labour force	✓ Laborers to be restricted to construction area. ✓ Access to the site should be restricted to employees of the contractor. ✓ Temporary ablution facilities to be provided at appropriate sites (one toilet for 14 laborers). ✓ Such ablution facilities to be kept away from natural water bodies. ✓ Cooking facilities to be provided in demarcated areas. ✓ All informal traders to be discouraged. ✓ All labor will undergo basic induction, where safety, health and	If local labour is used, the local community will benefit.	Contractor to identify suitable areas for the said facilities. Contractor to maintain the above facilities.	During construction	Not applicable	Skills and knowledge should be gained by these employees who assist in building local communities.

		environmentally issues will be discussed. ✓ Construction staff should be educated, prior to commencement of construction, as to the need to refrain from destruction or killing of animals and plants, as well as from indiscriminate defecation, waste disposal and / or pollution of local soil and water sources. ✓ The contractor should ensure proper supervision of employees at all times. ✓					
14.	Temporary jobs	✓ Local labor and contractors must be used wherever possible. Basic skills development and	Not applicable	Contractor	During construction	Low	Local laborers should be given priorities.

		capacity development must be incorporated with this. It will be a specific condition in the contractors' agreements that local labor be used wherever possible. All reasonable attempts will be made to appoint people from the local communities as temporary laborers for non- specialize tasks and they will be subject to the necessary basic skills training.					
15.	Security and crime	✓ Members of the community should be hired to patrol the premises during construction and maintenance.	Safety on site will be enhanced	Contractor	During construction and maintenance	Low	Crime could be reduced or completely eradicated by the improvement of security system.

		✓ The access of unauthorized individuals must be minimized.					
16.	Fire prevention and control	✓ Contractor must make sure that there is supervision for all fires that are used in the construction camp. ✓ Smoking should be prohibited in the vicinity of flammable substances. ✓ The contractor should ensure that fire-fighting equipment is available on site, in particular where flammable substances are stored. ✓ Fires started for comfort(warmth) should be discouraged by the contractor, due to the risk of vegetation fires and risk to adjacent property	Not applicable	Contractor	During construction	Low	Every public structure has to have fire prevention measures in place the presence of this facility is a necessity.

		✓ Fire-fighting equipment and emergency plans must be in place prior to the construction phase. ✓ The contractor will plan and implement a fire prevention programs and develop a contingency plan in the event of any fire. ✓ No refuse or waste may be burn. ✓ The contractor will be responsible for all damages caused by the outbreak of a fire originating from a site where work is undertaken. Damage to adjacent properties will be to his account. ✓ The contractor is to provide cooking areas					

		where fire risks will be minimized and controllable.					
17.	Safety and access control	✓ Safety equipment must be provided to all employees to prevent personal injury during construction activities. This includes equipment such as protective eye and ear wear and protective clothing where necessary. ✓ Staff should be appropriately trained in all assigned activities. ✓ Access to dangerous excavations and materials, must be controlled by the site manager. ✓ All personnel and vehicles used for transportation and/or construction	Safety on site will be enhanced	Contractor	During construction	Low	Safety and Access control will be management according to the requirement.

		purposes should remain within these demarcated areas. ✓ Excavations should only remain open of a minimum period of time and during this time the must be clearly demarcated so as to prevent accidental ingress of people and animals.					
18.	Material handling	✓ Re-fueling and maintenance of vehicles must take place off site. ✓ No oils, chemicals or other hazardous materials used during construction are to be stored on site.	Not applicable	Contractor and site workers	During construction	Not applicable	If employees will be properly trained to handle material this could avoid any incidents from occurring.
19.	Survey points	✓ Roads or trails that are cut to provide temporary access for survey work must be minimized.	Not applicable	Contractor	During construction	Low	Construction will only take place on the proposed or demarcated area.

		✓ Vegetation clearing must be kept to a minimum during survey operations.					
20.	Construction camp	✓ The choice of the site for the contractors' camp requires the Engineers permission and must take into account location of villagers and or ecological sensitive areas, including flood zones and unstable zones. ✓ The size of the construction camp should be kept to a minimum. ✓ The contractor must attend to the drainage of the camp to avoid standing water and or sheet erosion.	Not applicable	Contractor and engineers	During construction	Low	The site will be accessible and pose less impact on the environment if chosen in a correct place. The engineers should be responsible to ensure that the chosen place has less or no environmental impact.

21.	Workers conduct on site	✓ A general regard for the social and ecological well-being of the site and adjacent areas is expected of the site staff. ✓ Workers need to be aware of the following general rules: ✓ No alcohol / drugs to be present on site. ✓ No firearms are allowed on site or in vehicles transporting staff to or from the site (Unless used by the security personnel). ✓ Prevent excessive noise. ✓ No harvesting of firewood from the site or from the areas adjacent to it. ✓ Other than per-approved security staff, no workers shall be permitted to live on site.	Not applicable	Contractor	During construction	Not applicable	Workers will be provided sufficient SHERQ awareness training.

Operation and maintenance phase

The table below indicates the identified impacts and mitigation measures that could occur during operational and maintenance phases.

No.	Impact	Responsible person	Timeframe
1.	Storm water management: ✓ It is recommended that proper storm water drainage system be ensured during operation and maintenance phase. ✓ Storm water should not be allowed to discharge onto bare soil but must be diverted to the surrounding grasslands or to the landscaped gardens during the operational phase.	Operator	During operation and maintenance
2.	Clean-up action: ✓ In the event of incident or leakage of hazardous waste from storage site, a professional company to be appointed to remove and cleanup the waste as quickly as possible.	Operator and contractor	During both construction, operation and maintenance phases
3.	Waste generation and disposal: ✓ Solid waste generated during operation and maintenance phase must be removed in a continuous and efficient manner to the satisfaction of the local municipality. ✓ A waste management plan to be developed and maintained for the construction site. ✓ No solid waste should be dumped on the site. ✓ All domestic waste generated on the site should be disposed of in a proper manner off site i.e. no burial on site.	Operator and contractor	During construction, operation and maintenance

4.	Maintaining environmental complaint register: ✓ The environmental complaint register must be maintained during the operation and maintenance phase.	Operator	Operation and maintenance
5.	Maintenance of access roads: ✓ Access/ alternate roads to be maintained with an acceptable free of erosion, and no surface water ponding.	Operator	Operation and maintenance
6.	Traffic: ✓ Any traffic disruptions due to the movement of heavy machinery should be undertaken with the approval of all relevant authorities and in accordance with all relevant legislation.	Local municipality	

8. MANAGEMENT AND MONITORING

This section focuses on the systems and procedures required to ensure that the environmental specifications contained in the EMPr are effectively implemented, monitored and recorded.

General Monitoring and Reporting

The appointed ECO as well as the contractors on site are responsible for ensuring compliance with the EMPr. Monthly EMPr compliance reports (audits) will be compiled by the ECO and submitted to the contractor for his/her review and correction of non-compliance issues. It is the responsibility of the ECO to report any non-compliance, which is not correctly rectified to the contractor. Interested and Affected Parties (I&APs) have the right to monitor specific aspects of the EMPr (e.g. noise regulations, working hours stipulated) and must be allowed access to the EMPr document in conjunction with the contractor in a reasonable and informal manner, without unreasonably disrupting construction activities.

The contractor shall keep a record of all complaints received from the community and communicate them to the ECO. These complaints must be addressed and mitigated within reason. Records relating to the compliance/non-compliance with the conditions of the EMPr as well as audits reports shall be kept in good order. It is suggested that all records be kept for at least two years following construction activities for reference purposes.

Specific Roles and Responsibilities

The roles of the responsible people on site are included below:

Applicant

•The applicant shall ensure that the EMPr forms part of all contract documents;

•The applicant must ensure that the contractor and his/her subcontractors comply with all the environmental specifications outlined in this document;

•Assume overall responsibility for the effective implementation and administration of the EMPr;

•Ensure construction personnel are trained in accordance of the requirements of the EMPr.

The Contractor

Is responsible for complying with the EMPr during the construction phase of the development. The contractor is responsible for ensuring that his/her sub-contractors and their employees appointed by him/her are familiar with the EMPr and that they abide to conditions as set out in the EMPr. The contactor will be responsible for any non-compliance with the EMPr and will pay for any remedial work that may result from non-compliance resulting directly from his/her negligence.

Project Manager

The project Manager is responsible for overall management of project and EMPr implementation and has the following tasks:

•Be familiar with the recommendations and mitigation measures of this EMPr, and implement them;

•Monitor site activities on a daily basis for compliance;

•Conduct internal audits of the construction site against the EMPr;

•Confine the construction sites to the demarcated areas.

The Environmental Control Officer (ECO)

ECO is responsible for communicating environmental issues associated with the site to the contractor and his subcontractors. The ECO is responsible for the explanation of environmental issues contained in this EMP to anyone working on the site. Should any non-compliance with the EMPr take place, the ECO must communicate this with the party responsible for the non-compliance as well as the contractor. If the non-compliance continues after written request by the ECO to rectify the situation, the ECO must inform the local / provincial environmental authority in writing. Should any issues arise on the site of an environmental nature or concern, the ECO will be responsible for taking the appropriate action.

The Local/Provincial Environmental Authority

The local/provincial Environmental Authority responsible for taking action against any non-compliance with the EMPr by the Applicant, the Contractor or any of his/her subcontractors. The Local/Provincial Authority can request a compliance audit to be undertaken on the site at any time during the development phase of the project.

Emergency Procedures

The contractor must ensure that all emergency procedures are in place prior to commencing work. Emergency procedures must include, but are not limited to, fire, spills, contamination of the ground, accidents to employees, use of hazardous substances and materials, etc. The contractor must ensure that lists of all emergency telephone numbers/contact persons (including fire control) are kept up to date and that all numbers and names are posted at relevant locations throughout the duration of the construction period.

- **Fires**

The contractor must take all reasonable measures to ensure that fires are not started as a result of construction activities on site, and shall also ensure that their operations comply with the Occupational Health and Safety Act (Act No. 85 of 1993). The contractor shall ensure that there is basic firefighting equipment available on site at all times. The contractor shall appoint a member of his staff to be responsible for the installation and inspection of this equipment. The contractor is to ensure that he/she has the contact details of the nearest fire station in case of an emergency. No large open fires are permitted on site. Sparks generated during welding, cutting of metal or gas cutting can result in fires. Every possible precaution shall therefore be taken when working with this equipment near potential sources of combustion. Such precautions include having an approved fire extinguisher immediately available at the site of any such activities.

- **Safety**

The contractor must ensure that his employees comply with the Occupational Health and Safety Act (OHSA) (Act No. 85 of 1993). All reasonable measures must be taken to ensure the safety of all personnel on site. The contractor must ensure:

•Compliance with the Occupational Health and Safety Act (Act No. 85 of 1993);

•That all reasonable measures are taken to ensure the safety of all site staff;

•That all construction vehicles using public roads are in a roadworthy condition, that drivers adhere to the speed limits and that their loads are secured and that all local, provincial and national regulations are adhered to.

•That all accidents and incidents are recorded and reported to the ECO.

•Provision of first aid facilities at all times and in line with the requirements of Construction Regulations.

•Relevant Personal Protective Equipment (PPE)/clothing is provided to all personnel on site at all times.

•All accidents and incidents shall be recorded and reported to the Safety officer on site.

The contractor is to ensure that he/she has the contact details of the nearest emergency rooms (hospitals) to the site, of both private and public hospitals.

Construction Site

Restriction to Working Areas

Working areas are defined as those areas required by the contractor to undertake the works. It is important that activities are conducted within a limited area so as to facilitate control and to minimise the impact on the existing natural environment.

Access Roads

No any other access routes must be constructed. Only by-pass where necessary shall be constructed during the development phase of the project. Construction vehicles must be limited to approved access routes and areas on the site so as to minimise excessive environmental disturbance to the soil and vegetation on or close to the site.

Contractor's Camp

Prior commencement of construction activities, an area to be approved by the ECO should be fenced off for the use as a construction camp and for temporary staff

accommodation facilities during the construction period. The mesh size of the fence should be small enough to act as a filter net for litter as well as a demarcation of the site.

- No camp or office site shall be located closer than 200m from a stream or any drainage line;
- No trees or shrubs will be felled or damaged for the purpose of obtaining firewood;
- Permit to remove any protected tree shall be obtained from the relevant competent authority
- There has to be proper signage to indicate the particular area as camp site/office site;
- The contractor must ensure that the construction camp is enclosed with a fence for the duration of the construction period. The fence will serve to prevent public access to the camp, for public safety and security reasons. The contractor must maintain the fence for the duration of the construction period. All temporary fences must be removed on completion of the project;
- All temporary structures erected for construction purposes will be restricted to the construction campsite;
- All construction vehicles and machinery be stored in a location where an oil trap will be installed to prevent soil pollution. The ECO will advise the contractor on a suitable area on the site.

Security personnel and skeleton staff shall be supplied (by the contractor) with adequate protective clothing, ablution facilities, water and refuse facilities (with regular collection) and facilities for cooking and heating. These measures will ensure that open fires are not necessary.

Refuse and Waste Management

The contractor shall be responsible for the establishment of a waste management methods and removal system that prevents the spread of waste/refuse within and beyond the construction camp. The contractor shall make provision of waste collection facilities to collect for waste prior disposal and shall make arrangements for disposal thereof. Refuse refers to all solid waste, including construction debris (cement bags, wrapping material, timber, cans, wire, nails, etc.), waste and surplus food, food packaging, organic waste etc. The contractor shall be responsible for the establishment of a refuse control and removal system that prevents the spread of refuse within and beyond the construction site.

The contractor shall ensure that all refuse is disposed of by him and his sub-contractors' employees in refuse bins which he shall supply and arrange to be emptied as and when required. These bins must be adequate in number and accessibility.

Waste shall be separated into recyclable and non-recyclable waste, and shall be further separated as follows:

•Hazardous waste, consisting of substances that may be harmful to the receiving environment, and therefore require precautionary measures when handled. Examples include (but not limited to) oil, paint, diesel etc;

•General waste, consisting of non-hazardous substances and substances that cannot be recycled. Examples include (but not limited to) construction rubble, excess construction materials that cannot be reused, and food waste.

•Reusable construction material, which can be used at other construction sites.

•Recyclable waste shall preferably be deposited in separate bins. Recyclable material includes paper, tins and glass. The contractor is advised that "Collect-a-Can" collect tins, including paint tins, chemical tins, etc. for recycling.

Refuse bins shall be watertight, wind-proof and scavenger proof and shall be appropriately placed throughout the site and shall also be conspicuous (e.g. painted bright yellow). Refuse must also be protected from rain, which may cause

pollutants to leach out. Particular caution is to be exercised with regards to handling of hazardous waste, to ensure that it does not spill or leak from the waste collection containers. The utmost care must be taken to ensure that no waste is able to enter wetlands and/or dams on or near to the site. The contractor or the appointed Waste Removal Company shall truck refuse collected out of the construction site. Refuse must be disposed of at a Municipal registered landfill site, which is also approved of by the local authority. Refuse may not be burned or buried on or near the site.

The contractor shall provide cleaning services to clean up the contractors camp and construction site on a daily basis. These areas shall then be inspected by the contractor to ensure compliance with this requirement. A litter patrol around the construction area is to take place twice weekly to ensure that all litter is cleared up. The contractor shall be warned, in writing by the ECO, of any infringement and will be expected to clear the litter within 24 hours of the notification. The contractor will be responsible for removal of litter, which may wash into watercourse.

Ablution Facilities

The contractor will be responsible for the provision of sanitation for the sub-contractors and their staff. A minimum of one chemical toilet shall be provided per 15 individuals. Toilets provided by the contractor must be easily accessible. All toilets must be located within the construction site. Should toilets be needed elsewhere, their location must first be approved by the ECO. The ECO is responsible for ensuring that all toilet structures are suitably located and comply with requirements stated below.

•The toilets shall be neat construction and shall be provided with doors and locks and shall be secured to prevent them from falling over.

•Toilets shall be placed outside areas susceptible to potential flooding or within drainage channels. Toilets may not be placed in close proximity to the watercourse or drainage line. The contractor shall supply toilet paper at all toilets at all times.

•Toilet paper dispensers shall be provided in all toilets. The contractor shall ensure that the labourers make use of the toilets provided.

•The contractor (or reputable toilet-servicing company) shall be responsible for the cleaning, maintenance and servicing of the toilets. The contractor shall ensure that the toilets are emptied on a weekly basis or as required.

•The contractor shall ensure that no spillage occurs when chemical toilets are cleaned and emptied. Any accidental spillage must be reported to the ECO and the client, and cleaned up immediately. The contractor shall ensure that the toilets are protected from vandals.

If the contractor (or reputable toilet-servicing company) fails to provide and/or maintain all site sanitation facilities in a clean and hygienic condition, the ECO may request the contractor to suspend work until the requirements have been met. Washing areas must be situated away from the watercourse, and the use of biodegradable soaps is recommended.

Eating Areas

The contractor shall designate restricted areas for eating within the construction site. If fires are required for cooking purposes, they must be restricted to the construction camp and the location shall agreed upon by the ECO. The feeding, or leaving of food, for stray or other animals in the area is strictly prohibited.

Construction Vehicles and Machinery

Site vehicles are only permitted within the demarcated construction camp, as required, to complete their specific task. All construction vehicles should be in a good working order to reduce possible noise pollution. On-site vehicles must be limited to approved access routes and areas (including turning circles and parking) on the site so as to minimise excessive environmental disturbance to the soil and vegetation on site. Servicing and maintenance of vehicles on-site shall be done at areas specifically restricted for such use.

Material Storage and Stacking

Construction material and other building material may only be placed within the demarcated area, which must fall within the demarcated site. The contractor must, where possible, avoid stockpiling materials in vegetated areas that will not be cleared. Stockpiles of construction materials must be clearly separated from topsoil stockpiles in order to limit any contamination of the topsoil. Stockpiles must be located away from sensitive hydrological features (including but not limited to, watercourses, drainage channels, areas susceptible to erosion etc.).

Fuel and Chemical Management

The following shall apply when storing fuel and chemicals on site:

•The contractor shall ensure that fuels and chemicals (e.g. drums of fuel, grease, oil, brake fluid etc) are stored and handled carefully so as to prevent spillage. These liquids shall be confined to specific and secured areas within the contractor's camp and shall be clearly marked. Should the contractor intend to store such goods with a capacity of more than 80m^3, an application for Environmental Authorisation must be submitted to the DESTEA.

•The liquids will be stored in a bunded area with adequate containment (at least 1.5 times the volume of the fuel) with an impermeable floor beneath them for potential spills or leaks, in such a way that does not pose any danger of pollution even during times of high rainfall.

•In addition, the contractor must ensure that workers do not smoke or take part in any activity that may result in sparks in the vicinity of fuels and other flammable substances to prevent ignition. Relevant signage should be displayed at this points e.g. No smoking, flammable etc.

•Refuelling of vehicles shall only take place at a predetermined area, where adequate measures are in place to prevent spillage or pollution.

•The contractor will be responsible for ensuring that any party delivering potentially dangerous chemicals and oil to site is aware of the appropriate storage and drop-off locations and procedures. Transfer of hazardous chemicals and other potentially hazardous substances must be carried out so as to minimise the potential leakage and prevent spillage onto the soil.

Equipment

Drip trays must be put in relevant locations (inlets, outlets, points of leakage, etc) so as to prevent such spillage or leakage during transfer. The contractor shall stand any equipment that may leak, and does not have to be transported regularly, on watertight drip trays to catch any pollutants. The drip trays shall be of a size that provides at least 1, 5 times the total potential spillage. Drip trays shall be cleaned regularly and shall not be allowed to overflow. Substances, which cannot be reused, must be disposed of according to the relevant waste disposal procedure.

Handling of spillages

The contractor shall keep the necessary materials and equipment on site to deal with spillage of the relevant hazardous substances present on site. The contractor shall set up a procedure for dealing with spills, which will include notifying the ECO and the relevant authorities immediately following the spillage event. In the event

of a spill, appropriate steps must be undertaken to prevent pollution. The clean-up of spills caused as a result of the construction activities, and any damage to the environment, shall be for the contractor's own account. A record must be kept of all spills and the corrective action taken.

Working Hours

Working hours for all operations shall be limited to between 08h00 and 17h00 during weekdays (Monday to Friday) and between 08h00 and 13h00 on Saturdays. No work may take place on a Sunday or Public Holidays. Any deviations to these work hours must be cleared with the ECO and the Oversight committee prior to implementation.

Site Preparation and Clearing

Site preparation for the proposed construction works and site camp might involve the tree felling, clearing of brushwood, temporary removal of utilities, topsoil stripping and diversion/rechanneling of waterways. Vegetation loss result in loss of some valuable/protected species and it pose risks of erosion to exposed ground or stored topsoil, and increased runoff of water and siltation of water bodies. Natural vegetation does exist on the site. Vegetation on the site may be removed but care must be taken to confine removal of vegetation during construction activities to within the boundaries of the development area.

Heritage Sites and Features

A water cistern, troughs and other modern ruins in the centre of the study area were noted. More modern ruins along the southern boundary of the study area was also identified. None of these are considered to be historically significant. No archaeological or heritage sites have been uncovered on this site. Should such features be uncovered during construction, work must be halted immediately. Old burial grounds (if found) will be reported to the ECO who will advise the contractor as to the mode of action, which will include informing either the South African

Police Service (SAPS) and/or a representative from the South African Heritage Resources Agency (SAHRA).

Natural Features

Trees and natural vegetation, or any other natural features outside the work area, which will not be cleared for construction purposes, shall not be defaced, painted for benchmarks or otherwise damaged, even for survey purposes. The latter can only be done if agreed to by the ECO. Any feature defaced by the contractor shall be reinstated by the contractor to the satisfaction of the ECO.

Soil Management

Top soil shall not be removed from areas where physical disturbance of the surface will take place. The soil shall be stored and adequately protected from any pollution and erosion either by wind or water. The contractor shall temporarily stockpile excavated materials (e.g. soils and rocks) and construction materials in such a way that the spread of materials is minimised. The following measures must be applied when stock piling:

•The stockpiles must not be higher than 2m to avoid compaction.

•All stockpiled material must be easily accessible without any environmental damage.

•The stockpiles may only be placed within the demarcated areas the location of which must be approved by the site Environmental Officer (EO) or ECO (As applicable).

•It is suggested that the stockpiles be placed on the already disturbed areas of the building site. The contractor must, where possible, avoid stockpiling materials in vegetated areas that will not be cleared.

•Stockpiles are to be stabilised if signs of erosion are visible.

•Soils from different horizons must not be stockpiled such that topsoil stockpiles do not get contaminated by sub-soil material.

•Topsoil stockpiles must be monitored for invasive exotic vegetation growth. Contractors must remediate as and when required in consultation with the EO, RE and ECO (As applicable).

•Stockpiles of construction materials must be clearly separated from topsoil stockpiles in order to limit any contamination of the topsoil.

Pollution Control

Pollution could result from the release, accidental or otherwise, of chemicals, oils, fuels, sewage, wastewater containing organic kitchen waste, detergents, solid waste, litter and other such substances. The following measures must be implemented to prevent possible pollution"

•The contractor shall ensure that rainwater does not run into areas containing cement, oil, diesel and other such substances as this could result in a pollution threat to sensitive environmental areas.

•Fuel tanks must be placed in designated areas with concrete bunded walls, collection trays and fire extinguishers. Any spillage of fuel, oils, sewage resulting in soil contamination shall be cleaned up at the expense of the contractor.

•Used fuels/oils hydraulic fluids, paints solvents and grease must be stored in drums or suitable containers and must be disposed off at an appropriate site or sent to a local recycling plant.

•Never allow any hazardous substances to soak into soil.

Runoff from the site itself must be free from oil, waste and litter before joining the stormwater system. This must be ensured by securing any containers containing hazardous substances, in order that it cannot enter runoff, and by cleaning up any refuse and construction material from the site on a regular basis.

Waste and Refuse Management

During construction phase, waste will be generated. These include solid wastes such as papers, food and beverage tins and containers. Wastes lead to unsightly landscape/environment. Substantial impacts on the environment can occur due to litter, fuel, accidental release of hazardous materials and chemical spillage during construction phase of the proposed development. Excessive accumulation of waste around construction site may create untidy conditions.

•The contractor shall ensure enough waste collection facilities are available on site for collection of waste prior to disposal. He/she must ensure that all refuse is disposed of by him/her and his sub-contractors' employees in refuse bins supplied and arrange to be emptied on a weekly basis.

•Bins must be adequate in number and accessibility. Refuse bins shall be watertight, wind-proof and scavenger proof and shall be appropriately placed throughout the site. Refuse must also be protected from rain, which may cause pollutants to leach out.

•All solid and chemical wastes that are generated during construction must be removed and disposed of at a licensed waste disposal site. Chemical containers and packaging brought onto the site must be removed.

•Waste shall be separated into recyclable and non-recyclable waste, and shall be further separated as follows:

•Hazardous waste, consisting of substances that may be harmful to the receiving environment, and therefore require precautionary measures when handled. Examples include (but not limited to) oil, paint, diesel etc;

•General waste, consisting of non-hazardous substances and substances that cannot be recycled. Examples include (but not limited to) construction rubble, excess construction materials that cannot be reused, and food waste;

•Reusable construction material, which can be used at other construction sites;

•Recyclable waste shall preferably be deposited in separate bins painted in different colours. Recyclable material includes paper, tins and glass.

The contractor or the appointed Waste Removal Company shall truck refuse collected out of the construction site. Refuse must be disposed of at a registered Landfill site, which is also approved of by the contractor and the local authority. Refuse may not be burned or buried on or near the site.

Noise Nuisance

Due to the locality of the development, construction activities are likely to cause noise nuisance to the students and university personnel. Probably the two most important concepts in the regulation of noise are those of disturbing noise and noise nuisance.

•A disturbing noise is one that exceeds the zone sound level set by the local authority.

•A noise nuisance means any sound, which disturbs or impairs or may disturb or impair the convenience or peace of persons.

Some of the activities that could constitute a noise nuisance are power tools, driving, loading and hooters. All of these elements could be connected with construction activities. The contractor must obtain and familiarise him/herself with any regulations and municipal by-laws regarding noise and must ensure that he/she abides by these regulations at all times. It is recommended that the following measures be implemented to keep noise levels down:

•The contractor may not use sound amplifying devices on site, unless in emergency cases;

•No work is to be done after hours, working hours must be strictly adhered to (The operational schedule must be strictly adhered to. Work hours during the

construction phase shall be strictly enforced unless permission is given. Permission shall not be granted without consultation with the I&APs;

•Construction activities should be limited to normal working hours. Should normal working hours extend into evenings and weekends, students and campus dwellers should be timorously informed of the dates and the times of such activities. Noisy activities shall take place only during working hours.

•Construction vehicles and machinery must be kept in good order so not to cause excessive noise, Were possible the contractor must use equipment designed to limit noise levels;

•Employees exposed to high level of noise must be provided with ear protection gear.

•During construction, all reasonable precautions must be taken to minimise noise generated on site, especially when carrying out activities that may impact on neighbouring landowners and users. Every effort must be made to limit exceedingly noisy activities.

Noise reduction is essential and the contractor shall endeavour to limit unnecessary noise. The use of silent compressors is a specific requirement. The ECO must inform I&APs in writing 24 hours prior to any planned activities that will be unusually noisy or any other activities that could reasonably have an impact on the adjacent sites. These activities could include, but are not limited to, blasting (if required), piling, use of pneumatic jack-hammers and compressors, bulk demolitions, etc.

Air Quality

The contractor must take appropriate and reasonable measures to minimise the generation of dust as a result of his works, operations and activities. Additionally fumes from construction vehicles and machinery could contribute to air pollution if not addressed properly. Particular attention must be given to prevent dust generation during excavation and stockpiling and transportation activities. The

contractor is responsible for informing his/her sub-contractors and their employees to report any excessively dusty conditions to the contractor, the EO or the responsible representative. Corrective and preventative measures shall include but not be limited to:

•Regular (at least daily during dry and windy seasons) and effective treatment of working areas using water sprays and appropriate scheduling of dust-generating activities (potable water cannot be used as a means of dust suppression, alternative measures must be sourced);

•Covering for all load beds when transporting;

•The construction camp shall be watered during dry and windy conditions to control dust fallout.

•Concrete bags must not be allowed to blow around the site and spread cement dust.

•All construction vehicles and machinery shall be in good order and serviced regularly to avoid releasing excessive emissions to the atmosphere.

Erosion Control

The disturbance of steep slopes, for example by the removal of vegetation, may result in slope instability and erosion by rain and surface runoff. All slopes that are disturbed during construction shall immediately be stabilised to prevent erosion. Where re-vegetation of slopes is undertaken, this shall be done in accordance with the landscape architect (or appointed landscaper). The contractor must take reasonable measures to prevent erosion caused by their works. Erosion control measures must be in place in areas where runoff concentrates, in order to detain the sediment load and slow down the runoff. Erosion controls must be put in place on all drainage channels that drain into hydrological features. These measures may include, but not be limited to:

- silt fences;
- brushwood; and

- Rows of sawdust-filled onion bags.

Runoff containing high sediment loads shall not be released directly into natural or storm water drainage systems or nearby hydrological features. Any erosion that occurs during a heavy rainfall event must be remediated at the expense of the contractor. This will include clean-up of the silt deposited and filling up of erosion channels that may form. The contractor shall be responsible for rehabilitating all eroded areas in such a way that the erosion potential is minimised after construction has been completed.Storm water shall be delivered away from all construction or site areas in cut-off drains. The contractor shall ensure protection of areas susceptible to erosion by installing temporary or permanent structures such as meter drains, drainage pipes, sandbags, gabion mattresses etc.

Excavations, Trenching and Backfilling

All excavations for any purpose must be preceded by selective striping and stockpiling of topsoil for rehabilitation purposes of affected areas. Temporary stockpiles shall be done in a manner which will avoid erosion.

•Excavated areas must be barricaded to warn personnel of associated dangers.

•Rehabilitation should be progressive with construction and not left until the end of the project.

•The contractor shall temporarily stockpile excavated materials (e.g. soils and rocks) and construction materials in such a way that the spread of materials is minimised. The stockpiles must not be higher than 2m to avoid compaction.

•The contractor must avoid vegetated areas that will not be cleared. It is suggested that the stockpiles be placed on the already disturbed areas of the building site. Stockpiles are to be stabilised if signs of erosion are visible.

•Soils from different horizons must not be stockpiled such that topsoil stockpiles do not get contaminated by sub-soil material.

Public Safety

Appropriate measures shall be in place to warn I&AP's (including university personnel and students as well as any person(s) visiting the premises) interested and affected parties of the dangers during construction. Flagmen and women shall be deployed at any intersection to regulate passage and movement of traffic vehicles. Appropriate signage and information shall be displayed where necessary to warn the public of associated dangers. Speed limit shall be adhered to at all times to avoid accidents at by construction personnel and other road users during construction.

9. REHABILITATION

After construction, any area cleared or disturbed (as a result of the construction activities) within and outside the boundaries of the construction site shall be rehabilitated. The contractor shall be responsible for cleaning the contractor's camp and construction site of all structures, equipment, residual litter and building materials at the end of the contract and where necessary and appropriate, the ground scarified, topsoil restored and indigenous vegetation re-established. All construction equipment and excess aggregate, gravel, stone, concrete, bricks, temporary fencing and the like shall be removed from the site upon completion of the work. No discarding of burying of materials of whatsoever nature shall be allowed on the site, or on any vacant or open land in the area. Such materials may only be disposed of at the appropriate registered waste disposal site.

10.GENERAL CONDUCT

Each member of the work force shall be subjected to a project orientation period prior to commencing work on the site. The orientation shall include a discussion

on environmental matters of concern on this project. The ECO, with the assistance of the contractor, shall communicate all aspects of the EMP to the site staff (i.e. site agents to labourers) prior to commencement of excavation or any other environmentally disturbing activity. Basic environmental awareness training must be carried out for all employees (it is suggested that this be conducted in a language best understood by all employees) and should be included in safety training.

A copy of the EMPr must always be made available on site. General waste such as food wrapping and sanitary waste shall be confined to the work site and collected daily for appropriate disposal at an approved municipal landfill. Construction waste such as rubble shall be gathered up for disposal at an approved location. No waste is to be burned or disposed of on-site and construction personnel are required to confine their activities within the approved work site. It should be emphasized that the Environmental Practitioner shall be given the responsibility to inventory all the environmental aspects of the operation. Such responsibilities are to include the following:

•Documentation of specific environment-related activities, such as lists of fuel spill incidents.

•Ensuring that project related activities comply with contingency plans, regulatory permits and approval conditions, as well as contract provision or specifications.

•Providing environmental information for staff, and ensuring that all personnel and contractors understand the terms and conditions outlined in all regulatory permits and in the Management Plan.

•Maintaining the required records for environmental monitoring programs.

•Maintaining a photographic record of prior to, and during construction activities that have the potential to affect environmental resources in an adverse manner.

11. CONCLUSION

This EMPr is to be implemented in a cooperative spirit between all parties involved in this development. This EMPr must be used as a tool to support the development in being sustainable in environmental terms while still promoting economic and social development. It contributes to the environmental awareness of the workforce and can also facilitate the prevention of environmental degradation, and minimise impacts when they are unavoidable. It also describes the methods and procedures for mitigating potential impacts and monitoring thereof.

12. REFERENCES

1. Environmental Conservation Act of 1989 (Act No; 73 of 1989) Republic of South Africa, Pretoria Department of Environmental Affairs and Tourism (1998).

2. EIA Regulations-Implementation of Section 21, 22 and 26 of the Environment Conservation Act, Government Printer, Pretoria.

3. National Environmental Management Act of 1998 (Act No; 107 of 1998).

4. Regulation in terms of Chapter 5 of the National Environmental Management Act, 1998 (21 April 2005) Department of Environmental affairs and Tourism.

5. Occupational Health and Safety Act (OHSA) (Act No. 85 of 1993)

APPENDIX H: DETAILS OF EAP AND EXPERTISE

KULANI GLORY NKUNA

29 Tulana, Jozini street, Moreleta Park, Pretoria ,0181

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nkunakulani@yahoo.com ·

Can. Nat. Sci (500030/15)

I am a qualified Environmental Scientist with extensive experience in the field of Environmental Management, Environmental and Safety Risk Management as well as implementation and maintaining ISO14001 Environmental Management Systems. She has been involved in Environmental management throughout the project inception to completion and has assisted in implementing mitigation measures to minimise adverse environmental impacts and risk.

I have gained valuable experience in my career involvement and participation during the implementation of Culture based safety (CBS) systems that aimed at making safety a behaviours and way of life at the workplace and where employees were required to take ownership of their safety as well as that of their fellow employees.

I have completed various short courses in line with Environmental management such as, Environmental Impact Assessments (EIA), Environmental law, Risk Assessments, Environmental Auditing, Rehabilitation as well as HIRA training for supervisors. I have also completed a short course in the Implementation of Occupational Health and Safety Management Systems

WORK HISTORY AND EXPERIENCE

JANUARY 2016–JULY 2019

HSE COMPLIANCE MANAGER, ENERWASTE SOLUTIONS GAUTENG

- Implementation of ISO14001 Environmental Management Systems
- Implementing OHSAS 18001 Safety Management Systems
- Ensure compliance to licences issued(WML,AEL,EA)
- Conduct internal audits and external audits
- Ensure monitoring is implemented (air quality ,waste ,water)
- Advise senior management of SHEQ improvements
- Review operation procedures
- Ensure training is planned and conducted
- Financial planning for plant construction
- Monthly inspections
- Tenders
- Oversee production targets are reached
- Monthly and annual reporting to Environmental Affairs
- Annual reporting to City of Tshwane
- Awareness training

JANUARY 2016– MAY 2017

HSE &RISK, SIYAYA CONSULTING ENGINEERS

- Ensure legal compliance Compile risk Assessments
- Compile procedures and guideline documents Compiling of policies
- Report writing and quality assurance
- Review contractor HSE management plans through project inspections and audits
- Develop business hazard registers and risk control plans are implemented Co-ordinate HSE committee meetings
- Participate in accident investigations Record keeping of all HSE statistics
- Assist in HSE training
- Implementation and management of safety management systems

MAY 2011– DECEMEBER 2015

ENVIRONMENTAL OFFICER, TOTAL COAL SOUTH AFRICA

- Environmental management of the opencast mine
- Data capturing , for sustainable indicators reporting(waste , water quality monitoring, water consumption, electricity dust monitoring
- Implementing and ensuring compliance to Environmental Authorizations granted for mine activities
- Generating and issues non-compliance reports to any environmental nonconformance to any law, EMP, License, SOP or TCSA Standards
- Ensuring and implementing compliance to Environmental Management Plans(EMP) requirements
- Training on environmental awareness to workforce Assisting with Internal Audits and External audits
- Identification and implementation of environmental project
- Liaising with the contactors.
- Preparing monthly and other reports for management. Reporting of all environmental incidences
- Ensuring that the ISO 14001 EMS is current so that the mine remains certified to ISO 14001.
- Ensuring that all mine activities comply with all relevant legislation.
- Identifying environmental non-compliances and ensuring formal remedial action plans are prepared and followed up.
- Ensuring that all necessary internal and external environmental reporting is done as required

JULY 2009–APRIL 2011

JUNIOR CONSULTANT, PHAKI PHAKANANI ENVIRONMENTAL CONSULTANTS

- ❖ Compilation of Environmental Impact Assessment Reports for proposed new developments
- ❖ Compilation of Environmental Management Plans
- ❖ Conducting Public Participation process in line with the EIA Regulations

- ❖ Completing various application forms(Water applications, Notice of Intents, Waste license, site and retail license applications)
- ❖ Facilitating Progress of projects with the various departments
- ❖ Communicating with clients regarding Project Progress
- Conducting Public Participation by informing communities and local authorities about the various developments and addressing their issues and concerns(advertising , distributing letters, meetings and placement of site notices)
- Appointing of Specialist (when necessary)

PERFORM GENERAL RECEPTION DUTIES (ENSURE THE EFFICIENT & EFFECTIVE FUNCTIONING OF THE OFFICE)

- Attending incoming calls
- Welcoming of Clients and visitors
- Receiving and recording of incoming mail and invoices
- Completion of tender documents
- Arrange refreshments for meetings and staff birthdays when necessary
- Maintain a filling system on hard copy of the company document
- Order stationery and purchase office stationary
- Control the signing in and out Cameras and GPS(used for site visits)
- Sending, copying and filling of invoices
- Make follow – up on payments
- Record of travel receipts(Petrol ,Tollgates and refreshments

EDUCATION

JAN 2010

B-TECH ENVIRONMENTAL SCIENCE, TSHWANE UNIVERSITY OF TECHNOLOGY

- **MAJOR SUBJECTS , ENVIRONMNETAL MANAGEMENT , ENVIRONMENTAL RESOURCES , ENVIRONMENTAL CHEMISTRY , REHABILITATION**

JAN 2007 –DEC 2009

N.DIPLOMA ENVIRONMENTAL SCIENCE, TSHWANE UNIVERSITY OF TECHNOLOGY

- **MAJOR SUBJECTS, ENVIRONMNETAL RESOURCES, ENVIRONMENTAL MANAGEMENT**

JAN 2001 –DEC 2005

SECONDARY SCHOOL (MATRIC), LORETO CONVERT SCHOOL

SHORT COURSES:

2016: IMPLEMENTING AN OCCUPATIONAL HEALTH AND SAFETY MANAGEMENT SYSTEM BASES ON OHSAS 18001

INSTITUTION: CENTRE FOR ENVIRONMENTAL MANAGEMENT, NORTH WEST UNIVERSITY POTCHEFSTROOM)

2014: BASIC PRINCIPLES OF ECOLOGICAL REHABILITATION AND MINE CLOSURE

INSTITUTION: CENTRE FOR ENVIRONMENTAL MANAGEMENT, NORTH WEST UNIVERSITY POTCHEFSTROOM)

2014: INTRODUCTION TO INTEGRATED WASTE MANAGEMENT FOR MANAGERS
INSTITUTION: CENTRE FOR ENVIRONMENTAL MANAGEMENT, NORTH WEST UNIVERSITY POTCHEFSTROOM)

2013: INTERNAL AUDITING BASED ON ISO 14001:2004
INSTITUTION: NQA AFRICA (CENTURION)

2013: ENVIRONMENTAL IMPACT ASSESSMENT: A PRACTICAL APPROACH
INSTITUTION: CENTRE FOR ENVIRONMENTAL MANAGEMENT, NORTH WEST UNIVERSITY POTCHEFSTROOM)

2012: HAZARD IDENTIFICATION, RISK ASSESSMENT AND CONTROL FOR SUPERVISORS
INSTITUTION: SAFETY AND TRAINING SOLUTIONS

2012: ENVIRONMENTAL RISK ASSESSMENT AND MANAGEMENT BASED ON ISO 31000
INSTITUTION: CENTRE FOR ENVIRONMENTAL MANAGEMENT, NORTH WEST UNIVERSITY POTCHEFSTROOM)

2011: IMPLEMENTATION OF ENVIRONMENTAL MANAGEMENT SYSTEM ISO 14001
INSTITUTION: CENTRE FOR ENVIRONMENTAL MANAGEMENT, NORTH WEST UNIVERSITY POTCHEFSTROOM

2011: ENVIRONMENTAL LAW FOR ENVIRONMENTAL MANAGERS
INSTITUTION: CENTRE FOR ENVIRONMENTAL MANAGEMENT, NORTH WEST UNIVERSITY POTCHEFSTROOM

SKILLS

- Good Management Skills
- Communication skills (report writing , presentation)
- Interpretation and display of information in graphs
- Leadership
- MS word, excel and PowerPoint
- Project planning
- Good organization skills

ACTIVITIES

Kulani has a great interest in law and policies and the implementation of such polies and as such her future aspirations is to be involved in such activities in the work place. She is conversant in the following languages, Xitsonga (Primary language), Zulu (basic), Sotho(basic) and English.

ACHIEVEMENTS

- Best performing student Grade 6
- Best performing student Grade 7 & and overall highest achiever
- Achieved certification for opencast mine IOS14001 EMS implementation first time audit (2012)
- Assisted with process for water use license and explosive magazine license for opencast mine (2013-2014)
- Assisted ARC with Coaltech project on soil stockpiles in mines which was successfully completed
- Assisted with Waste Management license, Air emissions license and transport license for Enerwaste Solutions (2016-2017)

REFERENCES

- Solly Mabunda (Enerwaste Solutions) 066 235 4781
- Mr. W illiam Seabi (Environmental Manager TCSA-(Exxaro) 011 441 6857
- Mrs. Ingrid Sithole (Environmental Officer TCSA) 073832 0440
- Ms Ilse Botha (HR Officer TCSA) 011 441 6865/071 603 8315
- Mr.Tsunduka Hatlane (Director) Phaki Phakanani Environmental Consultants cc
  Cell: 079 504 4234
- Mrs. Catherine Coni (lecturer Tshwane University of Technology)
  Cell: 083 442 8498 Tel: 012 382 6354

SACNASP

South African Council for Natural Scientific Professions

herewith certifies that

Kulani Glory Mabunda

Registration Number: 500030/15

is a registered scientist

in terms of section 20(3) of the Natural Scientific Professions Act, 2003
(Act 27 of 2003)
in the following fields(s) of practice (Schedule 1 of the Act)

Environmental Science (Candidate Natural Scientist)

Effective **22 July 2015** Expires **31 March 2021**

Chairperson

Chief Executive Officer

To verify this certificate scan this code

Tshwane University of Technology

We empower people

NATIONAL DIPLOMA

ENVIRONMENTAL SCIENCES

Awarded to

KULANI GLORY MABUNDA

206028360 **1988-05-11**

Having complied with the Requirements of the Act and Statute

2009-12-18

GESERTIFISEER 'N WARE AFSKRIF
VAN DIE OORSPRONKLIKE
CERTIFIED A TRUE COPY OF THE ORIGINAL
22/06/2020
NICO CRAIL - POSTNET OLIVEWOOD ND36874
COMMISSIONER OF OATHS
OATHS NUMBER: 9/1/8/2 PRETORIA

Vice-Chancellor and Principal
On behalf of Council and Senate

Registrar

Tshwane University of Technology, formerly known as Technikon North-West, Technikon Northern Gauteng or Technikon Pretoria.

NORTH-WEST UNIVERSITY ®
YUNIBESITI YA BOKONE-BOPHIRIMA
NOORDWES-UNIVERSITEIT

CEM SAATCA

SAATCA 01E

Centre for Environmental Management

This is to certify that

KG MABUNDA
8805110679085

successfully completed and
passed SAATCA approved examination

Implementing Environmental Management Systems (ISO 14001)

CEM-03.1/0068/2011

5-9 September 2011

NQF Level: 7

Prof. JG Nel
Executive Manager:
Centre for Environmental Management
Course Leader

Prof. JJ Pienaar
Dean Faculty of Natural Science

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OATHS NUMBER: 9/1/8/2 PRET

NORTH-WEST UNIVERSITY
YUNIBESITI YA BOKONE-BOPHIRIMA
NOORDWES-UNIVERSITEIT

CEM

Centre for Environmental Management

This is to certify that

KG MABUNDA
8805110679085

successfully completed the course

Environmental Law for Environmental Managers

CEM-02.1/0142/2011 NQF Level: 7

17-22 October 2011

Prof. JG Nel
Executive Manager:
Centre for Environmental Management
Course Leader

Prof. JJ Pienaar
Dean Faculty of Natural Science

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NORTH-WEST UNIVERSITY
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NOORDWES-UNIVERSITEIT

CEM

Centre for Environmental Management

This is to certify that

KG MABUNDA
8805110679085

successfully completed the course

Environmental Risk Assessment and Management Based on ISO 31000

CEM-05.2/0007/2012

20-24 August 2012

NQF Level: 6

Prof. JG Nel
Executive Manager:
Centre for Environmental Management
Course Leader

Prof. JJ Pienaar
Dean Faculty of Natural Science

GESERTIFISEER 'N WARE AFSKRIF VAN DIE OORSPRONKLIKE
CERTIFIED A TRUE COPY OF THE ORIGINAL
22/06/2020
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COMMISSIONER OF OATHS
OATHS NUMBER: 9/1/8/2 PRETORIA

SAFETY AND TRAINING SOLUTIONS

SAFETY AND TRAINING SOLUTIONS

CERTIFICATE OF COMPETENCE

AWARDED TO

K. MABUNDA

ID 8805110679085

for

SUCCESSFULLY COMPLETING THE

HAZARD IDENTIFICATION, RISK ASSESSMENT AND CONTROL FOR SUPERVISORS

TRAINING COURSE on 29 – 30 AUGUST 2012

GESERTIFISEER 'N WARE AFSKRIF
VAN DIE OORSPRONKLIKE
CERTIFIED A TRUE COPY OF THE ORIGINAL
22/06/2020
NICO GRAILL - POSTNET OLIVEWOOD
COMMISSIONER OF OATHS
OATHS NUMBER: 9/1/8/2 PRETORIA

DIRECTOR

CERTIFICATE NO: SATS 24273

16/MQA/0317/AC3/140210
MQA ACCREDITAION

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NOORDWES-UNIVERSITEIT

CEM

Centre for Environmental Management

This is to certify that

KG MABUNDA
8805110679085

successfully completed the course

Environmental Impact Assessment: A Practical Approach

CEM-05.1/0010/2013

6-10 May 2013

Proposed NQF Level: 5

Prof. JG Nel
Executive Manager:
Centre for Environmental Management
Course Leader

Prof. JJ Pienaar
Dean Faculty of Natural Science

GESERTIFISEER 'N WARE AFSKRIF
VAN DIE OORSPRONKLIKE
CERTIFIED A TRUE COPY OF THE ORIGINAL
22/06/2020
NICO CRAILL - POSTNET OLIVEWOOD
COMMISSIONER OF OATHS
OATHS NUMBER: 97/8/2 PR

nqa africa

This is to certify that

KG MABUNDA

I D Number

880511 0679 085

has successfully completed and passed the following course

ISO 14001 Internal Auditors
Training Course

Training period

17-19 July 2013

Facilitator: ***C Bate***

Facilitator Registration Number: ***75/01/12***

GESERTIFISEER 'N WARE AFSKRIF
VAN DIE OORSPRONKLIKE
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22/06/20
NICO CRAILL - POSTNET OLIVEWO
COMMISSIONER OF OATHS
OATHS NUMBER: 9/1/8/2 PRETORIA

nqa

On behalf of NQA AFRICA

NORTH-WEST UNIVERSITY ®
YUNIBESITI YA BOKONE-BOPHIRIMA
NOORDWES-UNIVERSITEIT

CEM

Centre for Environmental Management

This is to certify that

KG MABUNDA
8805110679085

successfully completed the short course on:

Introduction to Integrated Waste Management for Environmental Managers

CEM-06.2.1/0006/2014

28 July - 1 August 2014

Proposed NQF Level: 6

Prof. JG Nel
Executive Manager:
Centre for Environmental Management
Course Leader

Prof. JJ Pienaar
Dean Faculty of Natural Science

GESERTIFISEER 'N WARE AFSKRIF
VAN DIE OORSPRONKLIKE
CERTIFIED A TRUE COPY OF THE ORIGINAL
22/06/2020
NICO GRAILL - POSTNET OLIVEWOOD
COMMISSIONER OF OATHS
OATHS NUMBER: 07/2022 PRETORIA

NORTH-WEST UNIVERSITY ®
YUNIBESITI YA BOKONE-BOPHIRIMA
NOORDWES-UNIVERSITEIT

CEM

Centre for Environmental Management

This is to certify that

KG MABUNDA
8805110679085

successfully completed the short course on:

Basic Principles of Ecological Rehabilitation and Mine Closure

CEM-06.5.1/0009/2014

29 September – 3 October 2014

Proposed NQF Level: 6

Prof. JG Nel
Executive Manager:
Centre for Environmental Management
Course Leader

Prof. JJ Pienaar
Dean Faculty of Natural Science

GESERTIFISEER 'N WARE AFSKRIF
VAN DIE OORSPRONKLIKE
CERTIFIED A TRUE COPY OF THE ORIGINAL
22/06/2020
NICO GRAILL - POSTNET OLIVEWOOD
COMMISSIONER OF OATHS

NORTH-WEST UNIVERSITY
YUNIBESITI YA BOKONE-BOPHIRIMA
NOORDWES-UNIVERSITEIT

CEM

Centre for Environmental Management

This is to certify that

KG NKUNA
8805110679085

successfully completed the short course on:

Implementing an Occupational Health and Safety Management System based on OHSAS 18001

CEM-08.2.1/0010/2016
22-26 August 2016

Prof. JG Nel
Executive Manager:
Centre for Environmental Management
Course Leader

Prof. JJ Pienaar
Dean Faculty of Natural Science

GESERTIFISEER 'N WARE AFSKRIF VAN DIE OORSPRONKLIKE
CERTIFIED A TRUE COPY OF THE ORIGINAL
22/06/2020
NICO CRAIG POSTNET OLIVEWOOD
COMMISSIONER OF OATHS
OATHS NUMBER: 9/1/8/2 PRETORIA

APPENDIX I: SPECIALIST'S DECLARATION OF INTEREST

the detea
the department of economic development, tourism and environmental affairs
FREE STATE PROVINCE

DETAILS OF EAP AND DECLARATION OF INTEREST

	(For official use only)
File Reference Number:	
NEAS Reference Number:	
Date Received:	

Application for integrated environmental authorisation and waste management licence in terms of the-

(1) National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended and the Environmental Impact Assessment Regulations, 2010; and

(2) National Environmental Management Act: Waste Act, 2008 (Act No. 59 of 2008) and Government Notice 718, 2009

PROJECT TITLE

Application for environmental authorisation for the proposed township establishment on a portion of the farm Klipfontein 716 and farm Ceres 626, Bloemfontein

Environmental Assessment Practitioner (EAP):	Inaluk Consulting Services		
Contact person:	Kulani Nkuna		
Postal address:	29 Tulana Jozini street Moreleta Park		
Postal code:	0181	Cell:	072 783 4002
Telephone:	072 783 4002	Fax:	
E-mail:	Kulani@inaluk.co.za		
Professional affiliation(s) (if any)	SACNASP (500030/15)		

Project Consultant:	Inaluk Consulting Services		
Contact person:	Amukelani Khosa		
Postal address:	29 Tulana Jozini street Moreleta Park		
Postal code:	0181	Cell:	071 633 4485
Telephone:		Fax:	
E-mail:	Amukelani@inaluk.co.za amuckhosa@gmail.com		

4.2 The Environmental Assessment Practitioner

I, Kulani Nkuna , declare that –

General declaration:

- I act as the independent environmental practitioner in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting environmental impact assessments, including knowledge of the Act, regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, Regulations and all other applicable legislation;
- I will take into account, to the extent possible, the matters listed in regulation 8 of the Regulations when preparing the application and any report relating to the application;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- I will ensure that information containing all relevant facts in respect of the application is distributed or made available to interested and affected parties and the public and that participation by interested and affected parties is facilitated in such a manner that all interested and affected parties will be provided with a reasonable opportunity to participate and to provide comments on documents that are produced to support the application;
- I will ensure that the comments of all interested and affected parties are considered and recorded in reports that are submitted to the competent authority in respect of the application, provided that comments that are made by interested and affected parties in respect of a final report that will be submitted to the competent authority may be attached to the report without further amendment to the report;
- I will keep a register of all interested and affected parties that participated in a public participation process;
- I will provide the competent authority with access to all information at my disposal regarding the application, whether such information is favourable to the applicant or not;
- all the particulars furnished by me in this form are true and correct;
- will perform all other obligations as expected from an environmental assessment practitioner in terms of the Regulations; and
- I realise that a false declaration is an offence in terms of regulation 71 and is punishable in terms of section 24F of the Act.

the detea
the department of economic development, tourism and environmental affairs
FREE STATE PROVINCE

Disclosure of Vested Interest (delete whichever is not applicable)

- I do not have and will not have any vested interest (either business, financial, personal or other) in the proposed activity proceeding other than remuneration for work performed in terms of the Environmental Impact Assessment Regulations, 2010;

- I have a vested interest in the proposed activity proceeding, such vested interest being:

None

Signature of the environmental assessment practitioner:

INALUK CONSULTING SERVICES

Name of company:

14/10/2019

Date:

Fountain Tower
34 Markgraaf Street
Bloemfontein
9300

Private Bags X 20801
Bloemfontein
9300

Tel: +27 (0)51 400 4812
Fax: +27 (0)51 400 4842
e-mail: mkhosana@detea.fs.gov.za

DETAILS OF SPECIALIST AND DECLARATION OF INTEREST

	(For official use only)
File Reference Number:	
NEAS Reference Number:	
Date Received:	

Application for environmental authorisation, integrated environmental authorisation and waste management licence in terms of the-

(1) National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended and the Environmental Impact Assessment Regulations, 2014; and

(2) National Environmental Management Act: Waste Act, 2008 (Act No. 59 of 2008) and Government Notice 921, 2013

PROJECT TITLE

Proposed township situated on a portion of the farm Kliprivier 716 and Ptn. Citrus 624, Meyerton, Merafong Magaliesberg Municipality, Free State Province.

Specialist: (ecologist)	Marius Venter		
Contact person:	Marius Venter		
Postal address:	Suite 116, Private Bag X01 Brandhof		
Postal code:	9324	Cell:	072 8166 83
Telephone:	051 436 0793	Fax:	051 436 0791
E-mail:	marius@mvenviro.co.za		
Professional affiliation(s) (if any)	SACNASP candidate scientist		

Project Consultant:	TMAfrik Consulting		
Contact person:			
Postal address:			
Postal code:		Cell:	
Telephone:		Fax:	
E-mail:			

4.2 The specialist appointed in terms of the Regulations_

I, Mpinis Venter , declare that –

General declaration:

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, Regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing – any decision to be taken with respect to the application by the competent authority; and – the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- all the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of Regulation 48

MVenter

Signature of the specialist:

Enviroworks

Name of company (if applicable):

18/10/2019

Date:

DETAILS OF SPECIALIST AND DECLARATION OF INTEREST

	(For official use only)
File Reference Number:	
NEAS Reference Number:	
Date Received:	

Application for integrated environmental authorisation and waste management licence in terms of the-

(1) National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended and the Environmental Impact Assessment Regulations, 2010; and

(2) National Environmental Management Act: Waste Act, 2008 (Act No. 59 of 2008) and Government Notice 718, 2009

PROJECT TITLE

Township Establishment of 4000 sites on portion of the farm Klipfontein 716 and Farm Ceres 626, , Mangaung Metropolitan Municipality, Bloemfontein.

Specialist:	CIVIL ENGINEER		
Contact person:	LEON WENTZEL		
Postal address:	PO BOX 12645		
Postal code:	0028	Cell:	082 574 3558
Telephone:	012 343 6297 / 0845	Fax:	012 343 6929
E-mail:	mail@civilconsult.co.za		
Professional affiliation(s) (if any)	ECSA, SAICE, IMESA, CESA		

Project Consultant:	Inaluk Consulting Services		
Contact person:	Kulani Nkuna		
Postal address:	29 Tulana Jozini street Moreleta Park		
Postal code:	0181	Cell:	072783 4002
Telephone:	072 783 4002	Fax:	
E-mail:	kulani@inaluk.co.za		

4.2 The specialist appointed in terms of the Regulations_

I, LEON WEVEZEL , declare that --

General declaration:

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, Regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority, and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- all the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of regulation 71 and is punishable in terms of section 24F of the Act.

Signature of the specialist:

CIVILCONSULT CONSULTING ENGINEERS (PTY) LTD
Name of company (if applicable):

18/05/2020
Date:

ENVIRONMENTAL IMPACT MANAGEMENT
Private Bag X20601 Tel: 051-408 4817/19
Bloemfontein Fax: 051-408 4842/11
9300 E-mail: mkhosana@dteea.fs.gov.za

DETAILS OF SPECIALIST AND DECLARATION OF INTEREST

	(For official use only)
File Reference Number:	
NEAS Reference Number:	
Date Received:	

Application for integrated environmental authorisation and waste management licence in terms of the-

(1) National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended and the Environmental Impact Assessment Regulations, 2010; and

(2) National Environmental Management Act: Waste Act, 2008 (Act No. 59 of 2008) and Government Notice 718, 2009

PROJECT TITLE

Ceres and Klipfontein Farms Developments - Bloemfontein

Specialist:	Delta Geotech (Pty) Ltd		
Contact person:	Matthew Jones		
Postal address:	5 Villa Road Nahoon		
Postal code:	5241	Cell:	0815867378
Telephone:		Fax:	
E-mail:	matthew@deltageotech.co.za		
Professional affiliation(s) (if any)	SACNASP and MSAIEG		

Project Consultant:	Inaluk Consulting Services		
Contact person:	Kulani Nkuna		
Postal address:	29 Tulana Jozini street Moreleta Park		
Postal code:	0181	Cell:	072783 4002
Telephone:	072 783 4002	Fax:	
E-mail:	kulani@inaluk.co.za		

4.2 The specialist appointed in terms of the Regulations_

I, Matthew Jones , declare that --

General declaration:

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, Regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- all the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of regulation 71 and is punishable in terms of section 24F of the Act.

Signature of the specialist:

Delta Geotech (Pty) Ltd

Name of company (if applicable):

13/05/2020

Date:

ENVIRONMENTAL IMPACT MANAGEMENT
Private Bag X20801 Tel: 051-400 4817/19
Bloemfontein Fax: 051-400 4842/11
9300 E-mail: mkhosana@dteea.fs.gov.za

destea
department of economic, small business development, tourism and environmental affairs
FREE STATE PROVINCE

DETAILS OF SPECIALIST AND DECLARATION OF INTEREST

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Application for environmental authorisation, integrated environmental authorisation and waste management licence in terms of the-

(1) National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended and the Environmental Impact Assessment Regulations, 2014; and

(2) National Environmental Management Act: Waste Act, 2008 (Act No. 59 of 2008) and Government Notice 921, 2013

PROJECT TITLE

Proposed new Township Development in Mangaung.

Specialist:	G & A Heritage Properties (Pty) Ltd.		
Contact person:	Stephan Gaigher		
Postal address:	P.O. Box 522, Louis Trichardt, 0920		
Postal code:	0920	Cell:	073 752 6583
Telephone:	(015) 516 1561	Fax:	-
E-mail:	stephan@gaheritage.co.za		
Professional affiliation(s) (if any)			

Project Consultant:			
Contact person:			
Postal address:			
Postal code:		Cell:	
Telephone:		Fax:	
E-mail:			

4.2 The specialist appointed in terms of the Regulations_

I, Stephan Gaigher, declare that –

General declaration:

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, Regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- all the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of Regulation 48

Signature of the specialist

G&A Heritage Properties (Pty) Ltd.

Name of company (if applicable):

2019/10/14

Date:

DETAILS OF SPECIALIST AND DECLARATION OF INTEREST

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File Reference Number:	
NEAS Reference Number:	
Date Received:	

Application for integrated environmental authorisation and waste management licence in terms of the-

(1) National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended and the Environmental Impact Assessment Regulations, 2010; and

(2) National Environmental Management Act: Waste Act, 2008 (Act No. 59 of 2008) and Government Notice 718, 2009

PROJECT TITLE

Palaeontological Impact Assesment for the proposed township development on portion of the farm Klipfontein 716 and Ceres 626, Bloemfontein, Mangaung Metropolitan Municipality, Free State

Specialist:	Palaeontologist		
Contact person:	E.Butler		
Postal address:	14 Eddie de Beer, Dan Pienaar, Bloemfontein		
Postal code:	9301	Cell:	084 4478 759
Telephone:		Fax:	
E-mail:	Elizebutler002@gmail.com		
Professional affiliation(s) (if any)	PSSA		

Project Consultant:	Inaluk Consulting Services		
Contact person:	Kulani Nkuna		
Postal address:	29 Tulana Jozini street Moreleta Park		
Postal code:	0181	Cell:	072783 4002
Telephone:	072 783 4002	Fax:	
E-mail:	kulani@inaluk.co.za		

4.2 The specialist appointed in terms of the Regulations_

I, **Elize Butler** , declare that –

General declaration:

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, Regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- all the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of regulation 71 and is punishable in terms of section 24F of the Act.

Signature of the specialist:

Banzai Environmental Pty Ltd

Name of company (if applicable):

17-07-2020

Date:

I hereby certify that this is a true copy of the original document and that there is no alteration that alterations has been made by an unauthorized person.

14/7/20 Branch Manager Pty Ltd

Signature

S.A POST OFFICE
Branch Manager
17 JUL 2020
DANHOF - 9310

ENVIRONMENTAL IMPACT MANAGEMENT
Private Bag X20601 Tel: 051-400 4817/19
Bloemfontein Fax: 051-400 4842/11
9300 E-mail: mkhosana@dteea.fs.gov.za

the detea
the department of economic development, tourism and environmental affairs
FREE STATE PROVINCE

Private Bag X20601
Bloemfontein
9300

Tel: 051-400 4817/19
Fax: 051-400 4842/11
E-mail: mkhosana@dtea.fs.gov.za

DETAILS OF SPECIALIST AND DECLARATION OF INTEREST

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Application for integrated environmental authorisation and waste management licence in terms of the-

(1) National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended and the Environmental Impact Assessment Regulations, 2010; and

(2) National Environmental Management Act: Waste Act, 2008 (Act No. 59 of 2008) and Government Notice 718, 2009

PROJECT TITLE

Township Establishment of 4000 sites on portion of the farm Klipfontein 716 and Farm Ceres 626, , Mangaung Metropolitan Municipality, Bloemfontein.

Specialist:	Transport Engineer		
Contact person:	Mark Marais		
Postal address:	23 2nd Ave Westdene		
Postal code:	9300	Cell:	0723266465
Telephone:	0514118700	Fax:	
E-mail:	Mark.marais@smec.com		
Professional affiliation(s) (if any)	ECSA: 20160443		

Project Consultant:	Inaluk Consulting Services		
Contact person:	Kulani Nkuna		
Postal address:	29 Tulana Jozini street Moreleta Park		
Postal code:	0181	Cell:	072783 4002
Telephone:	072 783 4002	Fax:	
E-mail:	kulani@inaluk.co.za		

ENVIRONMENTAL IMPACT MANAGEMENT
Private Bag X20801 Tel: 051-400 4817/19
Bloemfontein Fax: 051-400 4842/11
9300 E-mail: mkhosana@dteea.fs.gov.za

4.2 The specialist appointed in terms of the Regulations_

I, **Mark Marais** , declare that --

General declaration:

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, Regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- all the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of regulation 71 and is punishable in terms of section 24F of the Act.

Signature of the specialist:

SMEC South Africa

Name of company (if applicable):

17/07/2020

Date:

ENVIRONMENTAL IMPACT MANAGEMENT
Private Bag X20801 Tel: 051-400 4817/19
Bloemfontein Fax: 051-400 4842/11
9300 E-mail: mkhosana@dteea.fs.gov.za

DETAILS OF SPECIALIST AND DECLARATION OF INTEREST

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Application for integrated environmental authorisation and waste management licence in terms of the-

(1) National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended and the Environmental Impact Assessment Regulations, 2010; and

(2) National Environmental Management Act: Waste Act, 2008 (Act No. 59 of 2008) and Government Notice 718, 2009

PROJECT TITLE

Township Establishment of 4000 sites on portion of the farm Klipfontein 716 and Farm Ceres 626, , Mangaung Metropolitan Municipality, Bloemfontein.

Specialist:	Professional Traffic Engineer		
Contact person:	J.W.Botha		
Postal address:	23 Second Avenue Westdene Bloemfontein		
Postal code:	9301	Cell:	083 453 9387
Telephone:	051 4118700	Fax:	
E-mail:	Cobus.botha@smec.com		
Professional affiliation(s) (if any)	Professional Engineer (no 890274)		

Project Consultant:	Inaluk Consulting Services		
Contact person:	Kulani Nkuna		
Postal address:	29 Tulana Jozini street Moreleta Park		
Postal code:	0181	Cell:	072783 4002
Telephone:	072 783 4002	Fax:	
E-mail:	kulani@inaluk.co.za		

4.2 The specialist appointed in terms of the Regulations_

I, **Jacobus Wilhelmus Botha** , declare that –

General declaration:

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, Regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- all the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of regulation 71 and is punishable in terms of section 24F of the Act.

JWBotha Pr Eng

Signature of the specialist:

SMEC (South Africa)

Name of company (if applicable):

2020/06/11

Date:

ENVIRONMENTAL IMPACT MANAGEMENT
Private Bag X20801 **Tel: 051-400 4817/19**
Bloemfontein **Fax: 051-400 4842/11**
9300 **E-mail: mkhosana@dteea.fs.gov.za**

DETAILS OF SPECIALIST AND DECLARATION OF INTEREST

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NEAS Reference Number:	
Date Received:	

Application for integrated environmental authorisation and waste management licence in terms of the-

(1) National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended and the Environmental Impact Assessment Regulations, 2010; and

(2) National Environmental Management Act: Waste Act, 2008 (Act No. 59 of 2008) and Government Notice 718, 2009

PROJECT TITLE

PROPOSED TOWNSHIP ON A PORTION OF THE FARM KLIPFONTEIN 716 AND FARM CERES 626 WITHIN MANGAUNG METROPOLITAN MUNICIPALITY, FREE STATE PROVINCE

Specialist:	Mora Ecological Services		
Contact person:	Mokgatla Molepo		
Postal address:	350 Johan St, Arcadia, Pretoria		
Postal code:	0007	Cell:	0814103763
Telephone:		Fax:	
E-mail:	mokgatlajm@gmail.com		
Professional affiliation(s) (if any)	SACNASP 009509		

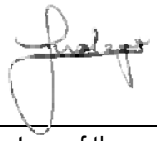
Project Consultant:	Inaluk Consulting Services		
Contact person:	Kulani Nkuna		
Postal address:	29 Tulana Jozini street Moreleta Park		
Postal code:	0181	Cell:	072783 4002
Telephone:	072 783 4002	Fax:	
E-mail:	kulani@inaluk.co.za		

4.2 The specialist appointed in terms of the Regulations_

I, **Mokgatla Molepo** , declare that --

General declaration:

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, Regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- all the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of regulation 71 and is punishable in terms of section 24F of the Act.



Signature of the specialist:

MORA ECOLOGICAL SERVICES (PTY) LTD

Name of company (if applicable):

15 JULY 2020

Date:

ENVIRONMENTAL IMPACT MANAGEMENT
Private Bag X20801 Tel: 051-400 4817/19
Bloemfontein Fax: 051-400 4842/11
9300 E-mail: mkhosana@dteea.fs.gov.za

APPENDIX J: ADDITIONAL INFORMATION

TITLE DEED

vzlr

ATTORNEYS PROKJREURS

Corner House,
38 Nel Street, 1st Floor
Nelspruit

T (013) 752 2060
E nelsprui@vzlr.co.za
F (013) 752 7472
www.vzlr.co.za

TO WHO IT MAY CONCERN

ONS VERW/OUR REF: **JC KRIEK /MAT2311**

U VERW/YOUR REF:

3 June 2019

Dear Sir
CONVEYANCER CERTIFICATE

I Jan Christiaan Kriek, an admitted Conveyancer of the High Court of South Africa and practicing at Nelspruit in Mpumalanga, hereby declare as follows:

MANGAUNG METROPOLITAN MUNICIPALITY

Is the registered owner of the following properties:

1. Remainder of the farm Klipfontein 716, district Bloemfontein, Province Free State
   In extent 251, 8379 (Two Hundred and Fifty One Comma Eight three Seven Nine) Hectares
   Held by Deed of Transfer T8942/2013
   Indicated on Surveyor Generals diagram SG 3841/1891

2. The farm Ceres 626, district Bloemfontein, Province Free State
   In extent 17, 1306 (Seventeen Comma One Three Zero Sex) Hectares
   Held by Deed of Transfer T8942/2013
   Indicated on Surveyor Generals diagram SG 675D/1907

Van Zyl Le Roux Inc. Reg. no. 1999/009202/21 Vat No: 4810187817 Directors / Direkteure: W A van Velden BA LLB (UP), C A Van Rensburg B Proc (UP), J R Van Rooyen B Iuris LLB (UOVS), C Grimbeek B Iuris LLB (UNISA), F Meyerune B Comm LLB (UOVS), P Kruger BC LLB (UP), J C Kriek LLB (Potch), E Kershaw LLB (UP), T Steyn B Comm LLB (UP) LLM (UNISA), P Gildenhuis B Comm LLB (UP) LLM (Procbk), P Robberts B Comm LLB (UP) Assisted By / Bygestaan Deur: Associates / Assosiate: B Tenner LLB (Potch), M Erasmus B Comm LLB (Potch), T W Snyman LLB (NWMU), B Mahomed LLB (NWMU) Junior Associates / Junior Assosiate: J P H Morse LLB (UM) (UP), M Van Der Merwe LLB (UOVS), J W Joubert LLD (Unisa) Professional Assistants / Professionele Assistente: J De Wet LLB (UP), B Smit LLB (UP), L A van Rooyen LLB (UP), T Fani LLB (UJ), P J Roos B Comm (HONS) LLB (UP), C Meyer B PROC (RAU) LLB (UP), D E Louw LLB (UOVS), A Hattingh Van Vuuren LLB (UP), A Van Niekerk B COM LLB (UP), C Coetzee LLB (NWU), C M Delport B COM LLB (UP) Consultants / Konsultante: P C Gildenhuys B Iuris LLB (UP), P A van Zyl B Proc (UP), C M Dreyer B Proc (UP) SAL LLB (UNISA), B Coetzee B Proc (UP) Abe Al / Ook Te: 1st Floor, Monument Office Park, Block B, Corner of Steenboklaan and Elephant. Tel: (012) 435 9444 Fax / Faks: (012) 435 9555. P O Box / Posbus 974, Pretoria, 0200. Docex 97, Pretoria B-BBEE Status - Level 4 Contributor

Remainder of the farm Klipfontein 716 as stated under paragraph one above is subject to the following conditions.

a.) "Subject by Notarial Deed of Servitude no 468/1940 registered 23rd day of February, 1940 to a servitude of right of way in favour of the General Public as indicated on Diagram SG no 866/1939 annexed to Deed of Transfer no 425/1940 and as will more fully appear from the said Notarial Deed"

Advise: It will have to be determined by a surveyor whether the said road falls within the proposed township land. If the road does affect the proposed township then provision would have to be made on the general plan of the said township and it would have to be indicated as a road/street.
If the road does not affect the proposed township land then the surveyor can make a certificate in this regard and the condition can be removed within the Conditions of Establishment due to its locality

b.) "Kragtens Akte van Sessie van Serwituut 3235/71 geregistreer op 7 Junie 1971 word n Serwituut van waterleiding (ewigdurend) ingevolge Waterwet 54/56 op en oor die streek, Grond ongeveer 752, 82 meter lank en 30,48 meter breed die benaderde roete waarvan in rooi aangedui word op kaart 3841/1891 daarby aangeheg oor binnegemelde eiendom, gesedeer aan die RSA soos meer ten volle sal blyk uit gesegde Akte van Sessie. Kragtens vierdie Akte van Sessie verval die onteienings endossement gedateer 29 Maart 1971 hierop."

Advise: It will have to be determined by a surveyor whether the said water pipeline servitude affect the proposed township. If it does affect the township land, then provisions would have to be made to indicate the said pipe line and state which erven it affects on the general plan and Conditions of Establishment.
If it does not affect the township land due to its locality then a letter from Bloem Water would have to be obtained stating that the pipe line and or any ancillary right would not be affected by the township establishment.

c.) The within mentioned property is subject to a water pipeline servitude, 20,00 metres wide in favour of Bloem Water as indicated by the lines a B c and d e on diagram SG 169/2002 with ancillary rights and further conditions as will more fully appear in Notarial Deed K695/2015S.

Advise: It will have to be determined by a surveyor whether the said water pipeline servitude affect the proposed township. If it does affect the township land, then provisions would have to be made to indicate the said pipe line and state which erven it affects on the general plan and Conditions of Establishment

If it does not affect the township land due to its locality then a letter from Bloem Water would have to be obtained stating that the pipe line and or any ancillary right would not be affected by the township establishment.

The farm Ceres 626, district Bloemfontein as stated above under paragraph two does not have any title conditions or servitudes that could be found during our investigation

I attach hereto copies of each of the portions that could be found with regards to our investigation for easy reference.

1. Farm Klipfontein – SG 3841/1891
2. Farm Ceres – SG 6750/1907

3. Title deed T8942/2013
4. Deed office data of both properties
5. Notarial deed K695/2015S
6. SG 169/2002 relating to K695/2015S
7. SG 866/1939 relating to condition (a)
8. SG1211/1997 relating to a water pipeline

We trust you find the above in order.

Yours faithfully,

VZLB ING.

J.C. KRUEK

Property enquiry results for "BLOEMFONTEIN RD, 716, 0" in the Deeds Registry at "BLOEMFONTEIN"

Property detail:

Deeds registry	BLOEMFONTEIN
Property type	FARM
Farm name	KLIPFONTEIN
Farm number	716
Portion	0 (REMAINING EXTENT)
Province	FREESTATE
Registration division/Administrative district	BLOEMFONTEIN RD
Local authority	MANGAUNG METROPOLITAN MUNICIPALITY
Previous description	-
Diagram deed number	G07/1892
Extent	251.8379 H
LPI Code	F0030000000007160000

Title Deeds detail:

Document	Registration date	Purchase date	Amount	Image Scanned reference	Document copy?
T8942/2013	20130816	20130625	R5380000.00	20151103 11:33:48	Yes

Owners detail:

Document	Full name	Identity Number	Share	Person Enquiry?
T8942/2013	MANGAUNG METROPOLITAN MUNICIPALITY	-	-	Yes

Endorsements / Encumbrances:

Endorsement / Encumbrance	Holder	Amount	Microfilm reference	Document copy?
K1140/1991S	BLOEMAREA WATERRAAD	-	-	Not available
K1206/1982S	-	-	-	Not available

K156/1988S	-	-	-	Not available
K695/2015S	-		20151103 11:33:14	Yes
BFN RD,716	-	-	-	Not available

History:

Document	Holder	Amount	Image Scanned reference	Document copy?
T10165/1982	KOTZE WILLEM FREDERIK	-	20130823 08:45:48	Yes

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Requested by **A0020781** with user reference **None** on: Friday, 31 May 119 15:26

DeedsWeb Version 4.0.1

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Property enquiry results for "BLOEMFONTEIN RD, 626, 0" in the Deeds Registry at "BLOEMFONTEIN"

Property detail:

Deeds registry	BLOEMFONTEIN
Property type	FARM
Farm name	CERES
Farm number	626
Portion	0
Province	FREESTATE
Registration division/Administrative district	BLOEMFONTEIN RD
Local authority	MANGAUNG METROPOLITAN MUNICIPALITY
Previous description	-
Diagram deed number	T22751/1908
Extent	17.1306 H
LPI Code	F0030000000006260000

Title Deeds detail:

Document	Registration date	Purchase date	Amount	Image Scanned reference	Document copy?
T8942/2013	20130816	20130625	R5380000.00	20151103 11:33:48	Yes

Owners detail:

Document	Full name	Identity Number	Share	Person Enquiry?
T8942/2013	MANGAUNG METROPOLITAN MUNICIPALITY	-	-	Yes

Endorsements / Encumbrances:

Endorsement / Encumbrance	Holder	Amount	Microfilm reference	Document copy?
I-101/1970MN-700805	KOTZE ADRIANA CECILIA B-E	-	-	Not available
K1206/1982S	-	-	-	Not available

K156/1988S	-	-	-	Not available
VA335/1982-T3884/194	1	-	-	Not available
BFN RD,626	-	-	-	Not available

History:

Document	Holder	Amount	Image Scanned reference	Document copy?
T10165/1982	KOTZE WILLEM FREDERIK	-	20130823 08:45:48	Yes

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Requested by **A0020781** with user reference **None** on: **Friday**, 31 May 119 15:30

DeedsWeb Version 4.0.1

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APPLICATION ACKNOWLEGDEMENT

destea
department of
economic, small business development,
tourism and environmental affairs
FREE STATE PROVINCE

Ref Nr: EMS/15/20/01
NEAS Ref Nr: FSP/EIA/0000339/2020
Enquiries: Dimakatso Mokoena
113 ST Andrews Street, Bloemfontein, 9300
Tel no: 051 400 4831
Email: mokoenad@destea.gov.za

Mr. Kulani Nkuna
Inaluk Consulting Services
29 Tulana Jozini Street,
Moreleta Park
0181

Telephone no: 072 783 4002
Email address: kulani@inaluk.co.za

Dear Mr. Nkuna,

ACKNOWLEDGEMENT OF RECEIPT OF COMPLETED APPLICATION FORM AND DRAFT SCOPING REPORT FOR THE PROPOSED CLEARANCE OF INDIGENOUS VEGETATION FOR TOWNSHIP ESTABLISHMMENT ON PORTION OF FARM KLIPFONTEIN 716 AND CERES 626 WITHIN MANGAUNG METROPOLITAN MUNICIPALITY.

The Department of Economic, Small Business Development, Tourism and Environmental Affairs (DESTEA) - "The Department" hereby acknowledge receipt of the application form on 07 May 2020, for the above-mentioned project.

Kindly note that your application is assigned to **Ms. Dimakatso Mokoena** as the case officer and all the correspondence regarding this application should be forwarded to case officer at above mentioned contact details. The application has been allocated the Department reference number (Ref No): **EMS/15/20/01** and **National Environmental Authorisation System (NEAS)** Ref No: **FSP/EIA/0000339/2020.** Both the indicated reference numbers should be quoted at all times throughout the EIA process and project life cycle e.g. documents, emails, letters etc. as indicated below:

DESTEA Ref No: EMS/15/20/01

NEAS Ref No: FSP/EIA/0000339/2020

Sub- Directorate: **Environmental Impact Assessment**
Private Bag X 20601 Tel +27 (0)51 400 4312
Bloemfontein E-mail: mkhosana@destea.gov.za
9300

destea
department of
economic, small business development,
tourism and environmental affairs
FREE STATE PROVINCE

ACKNOWLEDGEMENT OF RECEIPT OF COMPLETED APPLICATION FORM AND DRAFT SCOPING REPORT FOR THE PROPOSED CLEARANCE OF INDIGENOUS VEGETATION FOR TOWNSHIP ESTABLISHMMENT ON PORTION OF FARM KLIPFONTEIN 716 AND CERES 626 WITHIN MANGAUNG METROPOLITAN MUNICIPALITY.

The official is at present reviewing draft scoping report which is subjected to 30 days of public participation process as per sub-regulation 21 (1) and chapter 6 in terms of the 2014 EIA Regulations (as amended).

The NEMA EIA Regulations (as amended) Regulation 45 cautions that, this application will be deemed as having lapsed by the Competent Authority (CA) in this case DESTEA, if the application fails to meet any of the time frames prescribed in terms of these Regulations, unless the extension has been granted in terms of Regulation 3(7).

Please note that the activity applied for may not commence prior to an Environmental Authorisation being granted by the CA.

Regards,

Ms. D. Mokoena
Environmental Officer Production Grade A: EIM
Date: 03/06/2020

Sub- Directorate: **Environmental Impact Assessment**
Private Bag X 20601 Tel +27 (0)51 400 4512
Bloemfontein E-mail: mkhosana@destea.gov.za
9300

INALUK CONSULTING SERVICES
Tel No.: 072 783 4002 / 072 081 2130
Email: info@inaluk.co.za
Address: 29 Tulana, Jozini Street, Moreleta Park, 0181
www.inaluk.co.za

Free State Department of Economic, Small Business Development, Tourism and Environmental Affairs
Environmental Management Directorate
Private Bag X 20801
Bloemfontein
9300

Dear **Grace Mkhosana,**

APPLICATION FOR ENVIRONMENTAL AUTHORISATION FOR THE PROPOSED DEVELOPMENT OF A TOWNSHIP ON A PORTION OF THE FARM KLIPFONTEIN 716 AND FARM CERES 626, BLOEMFONTEIN

Inaluk consulting services has been appointed by Ngoti Development Consultants to undertake Environmental Impact Assessment in line with the proposed development of the Township within the Mangaung Local Municipality.

We hereby notify you on the intentions to lodge the application for authorisation of the proposed development. we also request the department to provide any consultation or guidelines which may be required prior to lodging the application in line with the EIA.

PROJECT DESCRIPTION:

The project footprint of the proposed development is 241 hectares and consist of various mixed uses as detailed in the attached layout plan.

As per the EIA Regulations as amended in 2017 the project is subjected to a scoping and full EIA for the activities associated with the proposed township development.

Your assistance to this matter will be highly appreciated. Should there be any queries Ms Kulani Nkuna can be contacted on kulani@inaluk.co.za or 072 783 4002.

Regards

Kulani Nkuna
Environmental Assessment Practitioner

CONFIRMATION OF SERVICES MUNICIPALITY