

APPLICATION FOR LAND USE CHANGE ACCORDING TO THE SPATIAL PLANNING AND LAND USE MANAGEMENT ACT (ACT 16 OF 2013)

WEGDRAAI TOWNSHIP FORMALISATION AND EXPANSION PROJECT: SUBDIVISION AND REZONING:

INVOLVED PROPERTIES:

ERF 1, WEGDRAAI, KENHARDT RD, !KHEIS LOCAL MUNICIPALITY,
NORTHERN CAPE PROVINCE;
ERF 45, WEGDRAAI, KENHARDT RD, !KHEIS LOCAL MUNICIPALITY,
NORTHERN CAPE PROVINCE;
ERF 47, WEGDRAAI, KENHARDT RD, !KHEIS LOCAL MUNICIPALITY,
NORTHERN CAPE PROVINCE.

**SUBMISSION DATE:
OCTOBER 2020**



COGHSTA
Department:
CO - OPERATIVE GOVERNANCE
HUMAN SETTLEMENTS & TRADITIONAL AFFAIRS
NORTHERN CAPE



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TOWN & REGIONAL PLANNERS
YOUR PARTNERS IN PROFESSIONAL PLANNING SERVICES

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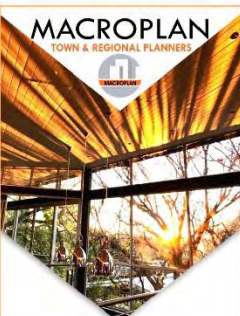

**SUBMISSION DATE:
OCTOBER 2020**

**WEGDRAAI
TOWNSHIP
FORMALISATION
AND EXPANSION
PROJECT**

**SUBDIVISION,
CONSOLIDATION AND
REZONING**

**INVOLVED PROPERTIES:
ERF 1, WEGDRAAI, KENHARDT RD, !KHEIS LOCAL
MUNICIPALITY, NORTHERN CAPE PROVINCE;
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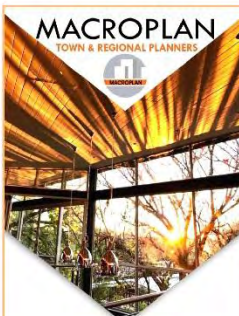



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SECTION A: COMPREHENSIVE APPLICATION FORM



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Application for Land Use amendment in terms of Spatial Planning and Land Use Management Act 16 of 2013.

Application for land use amendments

(give full details in the attached motivation report, if space provided is not enough)

SECTION 1

Details of Applicant (See Planning Profession Act, Act 36 of 2002)

Name:	Macroplan	Contact person:	Len Fourie JP Theron
Postal address:	P.O. Box 987 Upington 8800	Physical address:	4A Murray Avenue Upington 8801
Tel no:	054 332 3642	Cell no:	082 821 1025 082 821 1024
Fax no:	054 332 4283	E-mail address:	macroplan@mweb.co.za jptheron@mweb.co.za
SACPLAN Reg No:	Len J. Fourie: Pr.Pln. A/1322/2006 J.P. Theron: Pr. Pln. A/2394/2016 (Annexure O)		

Macroplan Town and Regional Planners, has been appointed by Barzani Development on behalf of the Department of Cooperative Governance, Human Settlements and Traditional Affairs (COGHTA).

SECTION 2

Details of Land Owner (If different from Applicant)

Name:	The Involved properties, Erven 1, 45 & 47, Wegdraai are owned by the !Kheis Local Municipality.	Contact person:	!Kheis Municipality: Fanus van Eck	Barzani Development: Marika Joubert
Postal address:	Private Bag X2 Groblershoop 8850	Physical address:	97 Oranje Street	9 Cambridge Office Park
Tel no:	054 833 9500	Cell no:	082 662 2771	066 457 5755
Fax no:	054 833 0690	E-mail address:	fvaneck3@gmail.com	Marika@Barzanigroup.co.za

If the applicant is not the registered owner(s), attach a power of attorney from the registered owner(s) to the application.

SECTION 3**Details of Property (In accordance with Title deed)**

<p>Erf / Farm No and portion description:</p>	<p><i>RESTANT ERF 1, WEGDRAAI, IKheis Municipality, Kenhardt RD, Northern Cape Province (hence refer to as Erf 1, Wegdraai);</i></p> <p><i>RESTANT ERF 45, WEGDRAAI, IKheis Municipality, Kenhardt RD, Northern Cape Province (hence refer to as Erf 45, Wegdraai);</i></p> <p><i>RESTANT ERF 47, WEGDRAAI, IKheis Municipality, Kenhardt RD, Northern Cape Province (hence refer to as Erf 47, Wegdraai);</i></p>	<p>Area (m² or ha):</p>	<p>Erf 1, Wegdraai: 8.2767ha</p> <p>Erf 45, Wegdraai: 48.5913ha</p> <p>Erf 47, Wegdraai: 4.7131ha</p>
<p>Physical address of erf/farm:</p>	<p>The involved properties forms the town commonage of Wegdraai, as such no physical address are allocated thereto. The locality of the involved properties can be described as follows:</p> <p>Erf 1, Wegdraai – Has a central-northern locale in regards to Wegdraai;</p> <p>Erf 45, Wegdraai – Comprise of two separate land portions, with one forming the western periphery and the other the eastern periphery of Wegdraai;</p> <p>Erf 47, Wegdraai - Has a westerly locate in regards to the town of Wegdraai and is netsled between the registered residential erven of Wegdraai and Erf 45, Wegdraai.</p>	<p>Existing Zoning:</p>	<p>Erf 1, Wegdraai: The area applicable to this submission is zoned as Open Space Zone III</p> <p>Erf 45, Wegdraai: The areas applicable to this submission are zoned as Undetermined Zone.</p> <p>Erf 47, Wegdraai: The areas applicable to this submission are zoned as Undetermined Zone.</p>
<p>Location from nearest town:</p>	<p>The involved properties are situated within the urban edge of Wegdraai.</p>	<p>Existing land use:</p>	<p>Erf 1, Wegdraai: The area applicable to this submission is vacant.</p>

Town/ suburb:	Situated within the delineated urban edge of Wegdraai.	Area applicable to application:	Erf 45, Wegdraai: The areas applicable to this submission are partially occupied by informal stands, whilst the remaining portion is vacant.
			Erf 47, Wegdraai: The areas applicable to this submission are partially occupied by informal stands, whilst the remaining portion is vacant.
			Erf 1, Wegdraai: 3ha of Erf 1, Wegdraai is subject to land use changes.
Registration Division:	Kenhardt RD	Title deed no:	Erf 45, Wegdraai: 27ha of Erf 45, Wegdraai is subject to land use changes.
			Erf 47, Wegdraai: 3ha of Erf 47, Wegdraai is subject to land use changes.
			A total of 33ha will be subject to the proposed changes of land use change.
			Erf 1, Wegdraai – T84788/2002
			Erven 45 & 47, Wegdraai – T36416/2002 (Annexure A)

SECTION 4

Type of Application being Submitted (Mark with an X and give detail)

Application for:

(Please mark applicable block with a cross)

The establishment of a township or the extension of the boundaries of a township.	
The rezoning from one zone to another	X
The removal, amendment or suspension of a restrictive or obsolete condition, servitude or reservation registered against the title of the land.	
The amendment or cancellation a general plan or SG Diagram	
The closure of any public place or road and street reserves	
The secondary use as provided for in the regulations (not supported by SDF)	
The departure from the development parameters of the zoning scheme	



The departure to use land for a purpose not provided for in the zoning scheme granted on a temporary basis	
The secondary use as provided for in the regulations (supported by SDF)	
The subdivision of land	X
The registration of a servitude	
The consolidation of land	X
The extension of the validity period of an approval	
The application for the exemption of subdivision and consolidations as provided for in the regulations	
Any other application not provided for in the table above	

Please give a short description of the scope of the project:

Our office, Macroplan Town and Regional Planners, has been appointed (See Annexure B) by Barzani Development on behalf of the Department of Cooperative Governance, Human Settlements and Traditional Affairs (hence referred to as COGHSTA), to facilitate the needed town planning procedures involved with a formalisation and expansion project for Wegdraai.

*Wegdraai has experienced normal population growth over the past few years, however, the provision for additional registered residential properties were never established to accommodate the population growth in Wegdraai. Residents have subsequently resorted to informal housing by means of occupying municipal or state owned land without undergoing the necessary town planning processes. COGHSTA is currently in the process of addressing the **housing backlog** within the Northern Cape, with numerous township establishment projects already identified of which the communities of the !Kheis Local Municipality forms part of.*

The proposed Wegdraai formalisation and expansion project entails the provision of 364 residential properties, as well as land uses normally associated township expansion, such as institutional uses, municipal uses and business premises. The goal of this application to obtain approval for the necessary town planning processes that are needed for formalisation of existing informal residential stands, make provision for residential expansion, incorporate land uses such as business, institutional (churches), municipal and recreational uses, whilst providing a coherent internal road network that promotes easy and accessible movement throughout.

In order for the planned Wegdraai formalisation and expansion project to take place, the following land use changes are required:

1. **CONSOLIDATION (See Figure 4):**
 - 1.1. Consolidation of Erf 45 & 47, Wegdraai into an individual land unit. Please note that the proposed consolidation of these properties will not adversely affect the previous subdivisions that took place thereon. The existing surveyed properties that were subdivided from Erven 45 & 47, Wegdraai have not been changed.
2. **SUBDIVISION (See Figure 5):**
 - 2.1. Subdivision of the newly consolidated land unit and the applicable portion of Erf 1, Wegdraai, into 389 individual cadastral land units.

2. REZONING (See Figure 6):

2.1. Rezoning of the newly created properties, thereby allocating appropriate land use rights to each of the newly created individual erven suitable to their future purpose within the Wegdraai formalisation and expansion project. The proposed zonings, in terms of the newly adopted IKheis Scheme Regulations, are as follow and should be read together with the final layout plan attached as Annexure E to this submission:

Zoning	Primary Use/s	Erven Amount
Residential Zone I	Residential House	364
Business Zone I	Business Premises	3
Institutional Zone II	Place of Worship	2
Open Space Zone II	Public Open Spaces	6
Transport Zone I	Public Street	6
Authority Zone I	Municipal Uses	1
Undetermined Zone	Undetermined	7
Total		389

Please refer to Figures 5 & 6, Annexure E, §2.8 & §3.3 of this report for more information in this regard.

SECTION 5

Detail of application (Mark with an X and give detail where applicable)

Is the land unit currently developed (buildings etc.)?	YES		If answered YES, what is the nature & condition of the developments / improvements?	Informal residential stands can be found on the applicable portions of Erven 45 & 47, Wegdraai.
Is the current zoning of the land utilised?		NO	If answered NO, what is the application / use of the land?	The areas that forms the study area to this submission are currently zoned as Open Space Zone II and Undetermined Zone. As mentioned, Informal residential stands can be found on the applicable portions of Erven 45 & 47, Wegdraai. This application will rectify this discrepancy between land use and zoning.
Is the property burdened by a bond?		NO	If answered YES, attach the bondholder's consent to the application:	Not applicable
Has an application for subdivision/ rezoning/ consent use/ departure on the property previously been	YES		If answered YES, when and provide particulars, including all authority reference numbers and decisions:	Erven 45 & 47, Wegdraai were subject to processes of land use change in the past, most likely as part of a previous formalisation process.

considered?				
Does the proposal apply to the entire land unit?		NO	If answered NO, indicate the size of the portion of the land unit concerned, as well as what it will be used for and the same for the remaining extent:	<p>Erf 1, Wegdraai: 3ha of Erf 1, Wegdraai is subject to land use changes.</p> <p>Erf 45, Wegdraai: 27ha of Erf 45, Wegdraai is subject to land use changes.</p> <p>Erf 47, Wegdraai: 3ha of Erf 47, Wegdraai is subject to land use changes.</p> <p>A total of 33ha will be subject to the proposed changes of land use change.</p>
Are there any restrictions, such as servitudes, rights, bonds, etc. with regard to the land unit in terms of the deed of transfer that should be lifted, as it might have an influence on this application?	YES		If answered YES, please provide detail description:	N/A
Are there any physical restrictions (e.g. steep inclines, unstable land formations, marshes, etc.) that might influence the intended development?	YES		If answered YES, name full particulars and state how the problem will be solved and submit detail layout plan:	<p>A myriad of specialist studies have been conducted on account of the Wegdraai formalisation and expansion project. For the most part the physiography of the study area is ideal for township establishment, however, the following should be noted:</p> <p>1. The Botanical Assessment Report (See Annexure F) identified numerous protected vegetation and the impact on the environment will be medium-low, but can be low through mitigation. Mitigation entails that the necessary permits from the relevant authorities be obtained for the removal of this vegetation prior to site clearance and construction;</p> <p>2. The Geological Report (See</p>

Is any portion of the land unit in a flood plain of a river beneath the 1:50 annual flood-line, or subject to any flooding?		NO	If answered YES, please provide detail description:	<p>Annexure G) concluded that the development site is intermediately suitable for residential development;</p> <p>3. Fresh Water Report (See Annexure I) concluded that a general authorisation for the planned housing development can be issued.</p> <p>4. The Heritage Impact Assessment (Annexure H) identified no significant heritage resources that will be impacted negatively by the proposed development</p> <p>Not Applicable</p>
Is any other approval that falls outside of this Act, necessary for the implementing of the intended development?	YES		If answered YES, please provide detail description:	<p>Various approvals/ no objections/ authorisations had to be obtained in relation to the proposed residential development and they are as follow:</p> <ul style="list-style-type: none"> • Environmental Authorisation: The final scoping report (Annexure J) has been submitted to DENC. The processing of the application has been limited, due to the Covid-19 protocols that have been enforced by the Department of Environment and Nature Conservation. This application for land use change is therefore submitted without the EA; • DRPW: The Department of Roads and Public Works has been furnished with a formal notification letter (Annexure L) for review on the 8th of October 2020. The formal response form

			<p>DRPW will be presented to the !Kheis Municipality upon receipt thereof;</p> <ul style="list-style-type: none"> Sanral: Sanral has been furnished with a formal notification letter (Annexure K) for review on the 13th of October 2020. The formal response form Sanral will be presented to the !Kheis Municipality upon receipt thereof; <p>The !Kheis Municipality has granted permission to submit this application and commence with the public participation process without the Environmental Authorisation, Sanral and DRPW no-objection. It should however be noted that this application will not proceed beyond the public participation process until the environmental authorisation and DRPW & Sanral no-objection have been obtained. Kindly note that the involved property is registered in the ownership of the !Kheis Municipality and therefore the input from the Department of Agriculture is not required.</p>
<p>What arrangements will be made regarding the following services for the development? (Full Engineering Reports must be supplied, where applicable). If services will be provided by the Municipality, proof of input from departments must be included as Annexure to the application.</p>	<p>Water supply:</p>	<p>BVI Consulting Engineering has been appointed to conduct a detailed services report (Annexure D) for Wegdraai formalisation and expansion project. The services report investigated the current bulk services capacity, determined the needed upgrades to accommodate the proposed expansion project and sought solutions to obtain the required funding to implement the necessary upgrades to the bulk services infrastructure. The findings of the services report for the provision of this service are as follow:</p> <p><i>"In conclusion, the engineering services are not in place (water and sewer) to meet the standard requirements. The infrastructure will have to be upgraded regardless of the implementation of the Wegdraai 360 houses development in order to meet current and expected future needs. The upgrading should be done in such a way as to take into consideration the Wegdraai 360 Houses development."</i></p>	

<p>What arrangements will be made regarding the following services for the development? (Full Engineering Reports must be supplied, where applicable). If services will be provided by the Municipality, proof of input from departments must be included as Annexure to the application.</p>		<p><i>Kindly refer to the services report for more detail on the proposed upgrading of municipal infrastructure.</i></p> <p>Funding can be applied for through the Municipal Infrastructure Grant (MIG) and Regional Bulk Infrastructure Grant (RBIG). For repair work at the water treatment works, the Water and Sanitation Infrastructure Grant (WSIG) can also be applied for.</p>
	Electricity supply:	<p>BVI Consulting Engineering has been appointed to conduct a detailed services report (Annexure D) for Wegdraai formalisation and expansion project. The services report investigated the current bulk services capacity, determined the needed upgrades to accommodate the proposed expansion project and sought solutions to obtain the required funding to implement the necessary upgrades to the bulk services infrastructure. The findings of the services report for the provision of this service are as follow:</p> <p><i>“In conclusion, the engineering services are not in place (water and sewer) to meet the standard requirements. The infrastructure will have to be upgraded regardless of the implementation of the Wegdraai 360 houses development in order to meet current and expected future needs. The upgrading should be done in such a way as to take into consideration the Wegdraai 360 Houses development.”</i></p> <p><i>Kindly refer to the services report for more detail on the proposed upgrading of municipal infrastructure.</i></p> <p>Funding can be applied for through the Municipal Infrastructure Grant (MIG) and Regional Bulk Infrastructure Grant (RBIG). For repair work at the water treatment works, the Water and Sanitation Infrastructure Grant (WSIG) can also be applied for.</p>
	Sewerage and waste-water:	<p>BVI Consulting Engineering has been appointed to conduct a detailed services report (Annexure D) for Wegdraai formalisation and expansion project. The services report investigated the current bulk services capacity, determined the needed upgrades to accommodate the proposed expansion project and sought solutions to obtain the required funding to implement the necessary upgrades to the bulk services infrastructure. The findings of the services report for the provision of this service are as follow:</p> <p><i>“In conclusion, the engineering services are not in place (water and sewer) to meet the standard requirements. The infrastructure will have to be upgraded regardless of the implementation of the Wegdraai 360 houses development in order to meet</i></p>

		<p><i>current and expected future needs. The upgrading should be done in such a way as to take into consideration the Wegdraai 360 Houses development.”</i></p> <p><i>Kindly refer to the services report for more detail on the proposed upgrading of municipal infrastructure.</i></p> <p>Funding can be applied for through the Municipal Infrastructure Grant (MIG) and Regional Bulk Infrastructure Grant (RBIG). For repair work at the water treatment works, the Water and Sanitation Infrastructure Grant (WSIG) can also be applied for.</p>
	Storm-Water:	<p>Storm water drainage will take place above ground, in natural furrows and along the streets of the proposed layout. The layout plan has been designed to accommodate all storm water furrows identified in the Freshwater Report, as well as align with the general topography of the development site. No Problems are expected in this regard.</p>
	Road Network:	<p>The Wegdraai formalisation and expansion layout exhibits an extended internal road network that functionally link with the existing road network of Wegdraai. The proposed residential development will effectively link with the existing road network of Wegdraai via numerous connections. The existing collector and arterial roads of Wegdraai will extent into the applicable portions of land, which forms the development site of this application. A hierarchy of road types have been designed throughout the planned town planning layout, in order to promote accessibility and mobility.</p> <p>As per the attached layout plane (Figure 7) three direct accesses to the provincial road that borders Wegdraai to the north have been requested from DRPW. DRPW has been informed of the Wegdraai formalisation and expansion project, as well as the connections to the provincial roads, and their formal response will be furnished to the !Kheis Municipality and ZF Mgcawu District Municipality upon receipt thereof. It is anticipated that a traffic impact assessment and detail engineering plans will be upheld as conditions to approval. Sanral has also been informed of the planned housing project, since the N10 borders Erf 45, Wegdraai to the east. A 30m buffer between the development site and the N10 has been proposed. The formal response from Sanral will be furnished to the !Kheis Municipality and ZF Mgcawu District Municipality upon receipt thereof.</p>

SECTION 6

List of Attachments and supporting information required / submitted with checklist for Municipal use (Mark with an X / number annexure)

Checklist (for the completion by the Applicant only)	Checklist (for the use of
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				Responsible Authority only)		
YES	NO	ANNEXURE	DOCUMENT ATTACHED	YES	NO	N/A
x		Section A	Completed Comprehensive Application form			
x		Section B	Complete Motivation Report			
x		§2.3	Alignment to the Provincial, District and Municipal SDFs			
	x		Public participation report (minutes of meetings, copies of advertisement, etc.)			
x		Annexure B	Power of Attorney (Board of Directors' / Trustees' resolution / consent)			
x		Annexure A	Copy of Title Deed(s)			
	x		Mortgage holder's consent			
x		Annexure C	Cadastral information – diagram/General Plan including servitudes, lease areas, etc.			
	x		Status report from Surveyor General – street closure or state owned land			
x		Figure 4	Topographic map/ aerial map			
x		Figure 1 & 2	Locality Map			
x		Annexure E	Site Plan			
x		Annexure N	Zoning Map			
	x		Zoning Certificate			
x		Figure 4	Land Use Map			
	x		Conveyancer's certificate			
	x		Special endorsement/proxy			
	x		Home Owners' Association consent			
x		Annexure E	Proposed design/layout plan			
x		Figure 5	Proposed subdivision plan			
	x		Proposed consolidation plan			
	x		Proposed development plan			
	x		Mineral rights certificate (together with mineral holder's consent) and/or prospecting contract			
	x		Mineral impact assessment (MIA)			
x		Annexure J (Final Scoping Report)	Environmental Impact Assessment (EIA – EA) including Heritage Impact Assessment (approval from Dept Sport, Arts and Culture) and Archaeological Impact Assessment (AIA) (approval from relevant Department - SAHRA)			
x		Annexure D	Detail Engineering Services report (Bulk and internal)			
x		Annexure L & M	Traffic impact study (SANRAL & DRPW no-objections)			
x		Annexure G	Geo-technical report (including geology) report (NHRB Standards)			
	x		Social impact assessment			
	x		Flood line assessment (1:50 and 1:100 years)			
	x		Coastal setback report (consent from Dept of Environmental Affairs)			
	x		Subdivision of agricultural land (consent of the Dept of Agriculture)			
	x		List of sections in Title Deed conditions to be removed /amended			
x		Annexure O	Adherence to planning legislation including the Planning Profession Act 36 of 2002			

x		At least three (3) sets of full colour documentation copies			
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SECTION 7**Declaration**

Note: If application is made by a person other than the owner, a Power of Attorney is compulsory. If the property is owned by more than one person, the signature of each owner is compulsory. Where the property is owned by a company, trust, or other juristic person, a certified copy of the Board of Directors/Trustees' resolution is compulsory.

I hereby certify the information supplied in this application form to be complete and correct and that I am properly authorised to make this application.

Applicant's / Owner's Signature:



Date:

2 0 2 0 1 0 2 5

Full name (print):

Justus Petrus Theron

Professional capacity:

Professional Town and Regional Planner

Applicant's ref:

Pr. Pln. A/2394/2016

Applicant's / Owner's Signature:



Date:

2 0 2 0 1 0 2 5

Full name (print):

Len Jacobus Fourie

Professional capacity:

Professional Town and Regional Planner – Senior Town Planner

Applicant's ref:

Pr.Pln. A/1322/2006

SECTION 8**Prescribed Notice and advertisement procedures**

(for the completion and use of Responsible Authority only)

Checklist for required advertisement procedure			Checklist for required proof of advertisement		
YES	NO	DOCUMENTATION AND STEPS TO BE TAKEN	YES	NO	DOCUMENTATION TO BE PROVIDED AS PROOF
		Notice to be placed in the Local Newspaper			Proof of Notice in Local Newspaper Note: The original newspaper advertisement or full colour copy, indicating page number and date.
		Notice to be placed in the Provincial Gazette (for 2 consecutive weeks)			Proof of Notice in the Provincial Gazette Note: The original newspaper advertisement or full colour copy, indicating page number and date.
		Notices to neighbours Note: The map indicating the neighbouring erven and list of neighbours will be provided. If the applicant chooses to deliver the notices per hand (Option 1), two copies of the notice must be provided on or before the date of the notice to each neighbour. One copy of the notice must			Proof of Notice to neighbours Note: Option 1: The signed notices of all surrounding neighbours, as identified by the Responsible Authority, must be provided. Note: Option 2: The proof of the registered mail must be provided to the Responsible Authority

		be signed by the respective party (neighbour) to be handed back to the Responsible Authority. Alternatively (Option 2), the notices can be sent via registered post.			
		Notice to be placed on the site Note: The notice provided must be placed on the site in a laminated A3 format (two language formats separate on A3) on or before the date of the notice.			Proof of Notice in site Two colour photos of the notice on site must be provided of which one is close up and the other one is taken from a distance in order to see the placing on the site itself.
		Public Meeting Note: The holding of a public meeting in order to inform the general public of the application.			Proof of Public Meeting The applicant must provide proof of the agenda, the attendance register and minutes of the meeting to the Responsible Authority.
		Any Additional components:			Proof of additional components:

SECTION B: MOTIVATIONAL REPORT

1. INTRODUCTION

1.1. BACKGROUND

GENERAL BACKGROUND



The Northern Cape Province is currently experiencing growth and development in a number of the urban centres throughout the province. The downscaling and slowing of the general economic market of South Africa, is however countered by development in the Renewable Energy field in some areas of the Northern Cape Province. This is due to the fact that a lot of the focus areas of the Renewable Energy Zones, are based in the mentioned province and brought new

development opportunities through diversification. The diversification brought about by this economic sector has benefitted existing and new businesses/ industries and moved the primary focus of some Municipal areas away from the normal agriculture, mining and tourism basis.

The !Kheis Local Municipality which is situated alongside the mighty Orange River, was able to benefit from intensive agricultural activities and growth in this sector. In the context of the aforementioned, urban centres in the municipality clustered around the Orange River with Groblershoop having become the seat of local governance and primary town. The growth in the agricultural sector of !Kheis has not only had an economic impact, but has also led to an increase in the population of the municipality where it could be expected that such increase took place both in the form of immigration and natural growth. This, in turn, has caused for an escalated need for housing opportunity, especially in the Groblershoop area. Less significant population growth has been experience within the town of Wegdraai, with this town forming the focus of this application for land use change.

The provision for additional registered residential properties were never established to accommodate the population growth in Wegdraai, subsequently residents have resorted to informal housing by means of occupying municipal or state owned land without undergoing the necessary town planning processes. COGHSTA is currently in the process of addressing the housing backlog within the Northern Cape, with numerous township establishment projects already identified of which the communities of the !Kheis Local Municipality forms part of.

This land use change application, compiled within the clear context of the Spatial Planning and Land Use Management Act (Act 16 of 2013), forms the legal framework under which the provision of sub-economic housing for the ever-growing population of Wegdraai are proposed. The application seeks to obtain the necessary land use change approval for the creation of 364 residential properties, in order to formalise existing informal residential stands, provide additional erven for future population growth, as well as include supportive land uses as requested by the Wegdraai community.

It is important that all developments must align with the provisions of the Spatial Development Framework (SDF) of the local or district municipality, as well as the applicable scheme regulations of a municipality. In cases where a development proposal does not align with the provisions of the SDF, site specific motivations need to be provided as to allow the District Municipal Planning Tribunal to make informed decisions.

1.2. CURRENT REALITY

The undertaking of the township establishment project, consisting of 364 residential erven, for the Wegdraai Community by Macroplan derives from an indirect appointment by COGHSTA and is therefore a project of national and provincial importance. The development site comprise of sections of Erven 1, 45 & 47, Wegdraai that can be best described as outlining the existing town of Wegdraai. The involved properties are all held under the ownership of the !Kheis Municipality, and a total of 33ha will be subject to land use changes. The proposed township establishment project will provide sub-economic housing with the end goal of securing ownership of land for the current residents. An estimate of approximately 200 informal stands currently exists in the town of Wegdraai that will be formalised as part of this township establishment project, whilst an additional 164 erven will be created for the future expansion of the community. A small fraction of the development scope will cater to middle-income housing, which will provide much needed income tax to the local municipality.

It should be noted that Erven 45 & 47, Wegdraai have been subject to processes of land use change in the past, with the purpose of formalising informal stands. The registration of these erven were competed at office of the Chief Surveyor General, but the registration at the Deeds Office was never finalised. As it stands Erven 45 & 47, Wegdraai are still the registered properties in terms of ownership at the Deeds Office.

The objectives of this application, which is handled in the terms of the provisions of the Spatial Planning and Land Use Management Act (Act 16 of 2013), !Kheis SPLUMA By-laws & the !Kheis Land Management Scheme are as follow:

1. **Formalise the existing informal stands currently established on the study area;**
2. **Provide additional residential properties for future population increases;**
3. **Incorporate land uses normally associated with residential expansion, such as institutional, recreational and business uses;**
4. **Create a coherent internal road network that adequately links to the existing road network of Wegdraai.**

The following table provides a breakdown of the involved land portions, in terms of size, land use and zoning:

Property Description	Property Size	Land Use	Zoning Status Quo
Erf 1, Wegdraai	8.2767ha	Vacant	Open Space Zone III
Erf 45, Wegdraai	48.5913ha	The areas applicable to this submission are partially occupied by informal stands, whilst the remaining portion is vacant.	The areas applicable to this submission are zoned as Undetermined Zone.
Erf 47, Wedgraai	4.7131ha	The areas applicable to this submission are partially occupied by informal stands, whilst the remaining portion is vacant.	The areas applicable to this submission are zoned as Undetermined Zone.

Table 1: Breakdown of property information.

The title deed of the involved properties has been scrutinised to determine if there are any restrictive conditions that needs to be removed in order for the land use change processes to take place. No such restrictive title deed conditions have been found within the title deeds of the involved properties (Annexure A).

In order to achieve the objective of providing sub-economic housing for the town of Wegdraai, this formal land use change application, pertaining to consolidation, subdivision & rezoning, is submitted to the !Kheis Local Municipality as municipality of first instance. This application for land use change (consolidation, subdivision & rezoning) is therefore submitted to the !Kheis Municipality in order to ensure legal compliance with the clear context of the Spatial Planning and Land use Management Act (Act 16 of 2013).

1.3. ASSIGNMENT

Our office, Macroplan Town and Regional Planners, has been appointed by Barzani Development on behalf of COGHSTA, to facilitate the needed town planning procedures involved with the formalisation and expansion of Wegdraai. The appointment letter from Barzani Development, as well as the preceding appointment letter from the !Kheis Municipality, serve as the power of attorney for this application for land use change. Please refer to Annexure B of this submission for the said authorising documentation.

1.4. OBJECTIVE

The objectives of this report are as follow:

1. CONSOLIDATION (See Figure 5):

- 1.1. Consolidation of Erf 45 & 47, Wegdraai into an individual land unit. Please note that the proposed consolidation of these properties will not adversely affect the previous subdivisions that took place thereon. The existing surveyed properties that were subdivided from Erven 45 & 47, Wegdraai have not been changed.

2. SUBDIVISION (See Figure 6):

- 2.1. Subdivision of the newly consolidated land unit and the applicable portion of Erf 1, Wegdraai, into 389 individual cadastral land units.

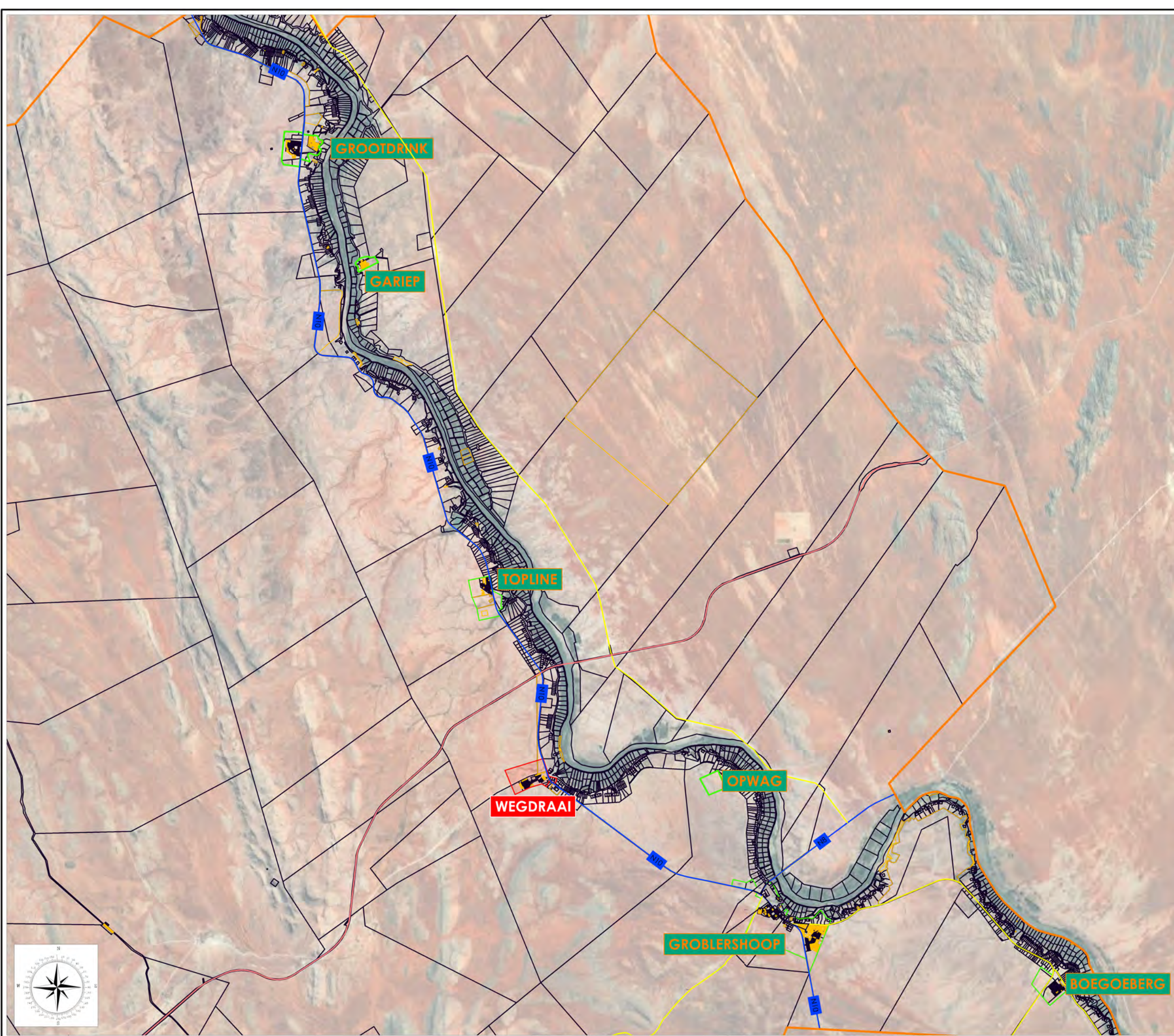
3. REZONING (See Figure 7):

- 3.1. Rezoning of the newly created properties, thereby allocating appropriate land use rights to each of the newly created individual erven suitable to their future purpose within the Wegdraai formalisation and expansion project. The proposed zonings, in terms of the newly adopted IKheis Scheme Regulations, are as follow and should be read together with the final layout plan attached as Annexure E to this submission:

Zoning	Primary Use/s	Erven Amount
Residential Zone I	Residential House	364
Business Zone I	Business Premises	3
Institutional Zone II	Place of Worship	2
Open Space Zone II	Public Open Spaces	6
Transport Zone I	Public Street	6
Authority Zone I	Municipal Uses	1
Undetermined Zone	Undetermined	7
Total		389

Please refer to Figures 5 & 6, Annexure E, §2.8 & §3.3 of this report for more information in this regard.

4. To serve as a support system for the IKheis Local Municipality, in order for all the formalities to be handled correctly.



Date:

18

Title:

Figure 1:
Locality Map: Region

Property Description:

Erven 1, 45 & 47, Wegdraai, !Kheis
Municipality, Northern Cape Province.

Legend

Wegdraai

National Roads

Regional Roads

Railway Line

Municipal Boundary


Municipality:


T. 054 833 9500

F. 054 883 9509

E. davyj@kheis.co.za

W. www.kheis.co.za


!Kheis
Munisipaliteit
Municipality



MACROPLAN
TOWN & REGIONAL PLANNERS
YOUR PARTNERS IN PROFESSIONAL PLANNING SERVICES

054 332 3642

4A Murray Avenue, Upington 8801 macroplan@mweb.co.za

PO Box 987, Upington 8800 www.macroplan.info

Reference:

(FIG1) 200806 Wegdraai Township Establishment

Designed:

JP Theron

Date:

August 2020

Drawn:

JP Theron

Scale:



1: 175 000

Figure 2: Locality Map: Local



Property Description:

Erven 1, 45 & 47, Wegdraai, !Kheis
Municipality, Northern Cape Province.

Legend

-  Study Area
-  National Roads
-  Regional Roads
-  Urban Edge

Cadastral Information:

-  Registered Erven
-  Surveyed Erven

Municipality:

T. 054 833 9500

F. 054 883 9509

E. davyj@kheis.co.za

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Consultant:



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054 332 3642

4A Murray Avenue, Upington 8801 macroplan@mweb.co.za
PO Box 987, Upington 8800 www.macroplan.info

Reference:

(FIG2) 200806 Wegdraai Township Establishment

Designed:

JP Theron

Date:

August 2020

Drawn:

JP Theron

Scale:

1: 6000

WEGDRAAI



1.5. JURISDICTION

The !Kheis Municipality recently approved the all-inclusive Land Use Management System (LUMS) for the entire !Kheis Local Municipal area, as such the entire municipal area will make use of the same planning policy and municipal SPLUMA by-laws. The !Kheis LUMS has been informed, guided and developed in terms of SPLUMA and will also be enacted in these terms. §26 of SPLUMA states the following:

- (2) Land may be used for the purposes permitted –
 - (a) By a land use scheme;
 - (b) By a town planning scheme, until such scheme is replaced by a land use scheme;

With the enactment of SPLUMA, the delegations of jurisdictions in terms of the decision making on land use change matters are however interpreted as follows:

§26(4): A permitted land use may, despite any other law to the contrary, be changed with the approval of a Municipal Planning Tribunal in terms of this Act.

§33(1): ...all land development applications must be submitted to a municipality as the authority of first instance.

§34(2): A district municipality may, with the agreement of the local municipalities within the area of such district municipality, establish a Municipal Planning Tribunal to receive and dispose of land development applications and land use applications within the district area.

§35(1): A municipality must, in order to determine land use and land development applications within its municipal area, establish a Municipal Planning Tribunal.

The !Kheis Municipality has established its own decision-making authority in terms of the parameters of SPLUMA. In the light of the above, this land use application is submitted to the !Kheis Municipality as the authority of first instance, for processing, administration and subsequent referral to the relevant decision-making authority.

Figure 3: General Land Use Map

Photo 1: Informal Houses on north-eastern most section of Wegdraai



As mentioned previously in this submission, an estimate of 200 informal stands already occupies portions of the involved properties. The informal houses visible in the image above, can be found in the north-eastern most section of Wegdraai on Erf 45, Wegdraai. These houses will be formalised as part of this submission.

Photo 2: Applicable portion of Erf 1, Wegdraai.



The applicable portion of Erf 1, Wegdraai can be seen in the image above, as seen from a north-westerly direction. This area is complete vacant and extremely flat, as such the medium income houses as planned on this section of Erf 1, Wegdraai.

Photo 3: Informal Houses to the west of Wegdraai



The informal houses to the west of Wegdraai can be seen in the image above, as seen from a northerly direction. These particular informal houses have been positioned within a suitable configuration that can be formalised without relocating any houses.

Photo 4: Another vantage point of informal houses to the west of Wegdraai.



In the image above the existing road network formed by the informal houses to the west of Wegdraai can be seen. These roads are wide enough and can therefore be formalised. The existing electrical infrastructure installed by Eskom can also be seen in the image above, making the formalisation of these informal houses in their current position important.

Photo 5: Provincial road bordering Wegdraai.



The provincial road that border Wegdraai to the north is visible in the image above, as seen from a westerly direction. New access from this road that leads into the involved land portion are requested from DRPW and their feedback in on this matter will be provided to the !Kheis Municipality upon receipt thereof.

Photo 6: South-eastern section to be developed



The area to the south-west of Wegdraai can be seen in the image above, as seen from a north-westerly direction. A few informal stands can be found on this land portion, most of which will be accommodated with the proposed layout plan.

1.6. COMPLIANCE WITH PRINCIPLES

SPLUMA sets out certain development principles (§7) to guide the development of land in the republic and any land use application should be considered with due cognisance of these principles. These principles may be briefly listed as follows:

1. THE PRINCIPLE OF SPATIAL JUSTICE;
2. SPATIAL SUSTAINABILITY;
3. EFFICIENCY;
4. SPATIAL RESILIENCE; AND
5. GOOD ADMINISTRATION.

The following sub-paragraphs may be highlighted in terms of this application, along with an explanation of their relevance:

(a) The principle of spatial justice, whereby –

- (i) Past spatial and other development imbalances must be redressed through improved access to and use of land;

Relevance: This application for formalisation of existing informal properties and provision of additional residential erven will address past spatial and other development imbalance, since integration will be achieved and the use of land will be improved.

- (ii) Spatial development frameworks and policies at all spheres of government must address the inclusion of persons and areas that were previously excluded, with an emphasis on informal settlements, former homeland areas and areas characterised by widespread poverty and depravation;

Relevance: This component is applicable to public entities such as municipalities and government department; it is therefore not the responsibility of an applicant to adhere thereto.

- (iii) Spatial planning mechanisms, including land use schemes, must incorporate provisions that enable redress in access to land by disadvantaged communities and persons;

Relevance: This component is applicable to public entities such as municipalities and government departments; it is therefore not the responsibility of an applicant to adhere thereto.

- (iv) Land use management systems must include all areas of a municipality and specifically include provisions that are flexible and appropriate for the management of disadvantaged areas, informal settlements and former homeland areas.

Relevance: This component is applicable to public entities such as municipalities and government departments; it is therefore not the responsibility of an applicant to adhere thereto.

- (v) Land development procedures must include provisions that accommodate access to secure tenure and the incremental upgrading of informal areas; and

Relevance: This component is applicable to public entities such as municipalities and government departments; it is therefore not the responsibility of an applicant to adhere thereto.

- (vi) A Municipal Planning Tribunal considering an application before it, may not be impeded or restricted in the exercise of its discretion solely on the ground that the value of land or property is affected by the outcome of the application.

Relevance: This component is applicable to public entities such as municipalities and government departments; it is therefore not the responsibility of an applicant to adhere thereto.

(b) The principle of spatial sustainability, whereby spatial planning and land use management systems must –

- (i) Promote land development that is within the fiscal, institutional and administrative means of the Republic;

Relevance: It is the opinion of this office that the proposed development will not place an unreasonable amount of stress on the fiscal, institutional and administrative capabilities of the area in which it will be situated, seeing as this request for township expansion will incorporate various uses that will address the additional pressure that such an expansion may cause; fiscally, institutionally and administratively speaking.

- (ii) Ensure that special consideration is given to the protection of prime and unique agricultural land;

Relevance: The !Kheis Municipality is the registered landowner of the land units involved in this submission for land use change, as such the involved properties are exempted from the provision of the Act 70 of 1970 as clearly described in the definition of agricultural land which reads as follow:

"Agricultural land" means any land, except-

- (a) land situated in the area of jurisdiction of a municipal council, city council, town council, village council, village management board, village management council, local board, health board or health committee, and land forming part of, in the province of the Cape of Good Hope, a local area established under section 6(1)(i) of the Divisional Councils Ordinance, 1952 (Ordinance 15 of 1952 of that province), and, in the province of Natal, a public health area as defined in section 1 of the Local Health Commission (Public Health Areas Control) Ordinance, 1941 (Ordinance 20 of 1941 of the last-mentioned province), and in the province of the Transvaal, an area in respect of which a local area committee has been established under section 21(1) of the Transvaal Board for the Development of Peri-Urban Areas Ordinance, 1943 (Ordinance 20 of 1943 of the Transvaal), and, in South-West Africa, a peri-urban area established under section 9 of the Peri-Urban Development Board Ordinance, 1970 (Ordinance 19 of 1970 of South-West Africa), but excluding any such land declared by the Minister after consultation with the executive committee concerned and by notice in the Gazette to be agricultural land for the purposes of this Act;
- (c) land of which the State or the administration of the territory of South-West Africa is the owner or which is held in trust by the State or a Minister or the Administrator of the said territory for any person;

- (iii) Uphold consistency of land use measures in accordance with environmental management instruments;

Relevance: The magnitude of the proposed housing development necessitates the undertaking of an Environmental Impact Assessment (EIA), under the guidance of the National Environmental Management Act (107 of 1998). At present the EIA is still in process, due to the constraints brought forth by the Covid-19 pandemic. The Environmental Authorisation will be provided to the !Kheis Local Municipality and the ZF Mgcawu District Municipal Planning Tribunal upon receipt thereof.

- (iv) Promote and stimulate the effective and equitable functioning of land markets;

Relevance: It is the opinion of this office that the proposed development will contribute to the value of land in the area surrounding thereto, but that it will not necessarily unfairly increase the cost thereof.

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

Relevance: This application for the township expansion falls under the jurisdiction of the !Kheis Municipality, as such the provision of services will be the responsibility of the !Kheis Municipality. A services report was compiled on the basis of the proposed residential expansion, with the general findings being that the existing bulk service infrastructure is not sufficient to accommodate the additional erven. The !Kheis Local Municipality will be responsible for procuring funding from the various bulk services infrastructure grants.

- (vi) Promote land development in locations that are sustainable and limit urban sprawl; and

Relevance: The area that comprise the study area is confined by the urban edge of Wegdraai, as such this application does not contribute to urban sprawl. In terms of sustainability the study area is also included in the !Kheis Spatial Development Framework.

- (vii) Result in communities that are viable.

Relevance: This application does not include any land use changes that will cause the developments on the properties to be at odds with the SDF, it is therefore perceivable that it will not have an adverse effect on the Wegdraai community.

(c) The principle of spatial efficiency, whereby –

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

Relevance: Please refer to §2.5 of this submission for details regarding the rendering of services;

- (ii) Decision-making procedures are designed to minimise negative financial, social, economic or environmental impacts; and

Relevance: The SPLUMA By-laws and Land Use Management Scheme of the !Kheis Local Municipality indicates the specific procedures that are to be followed with a land use change application such as this. This will ensure that both the Municipality, the relevant community and our client will be guarded against negative social, economic and environmental impacts.

- (iii) Development application procedures are efficient and streamlined and timeframes are adhered to by all parties.

Relevance: As the applicant in this instance, our office will do our very best to adhere to the timelines set by the local municipality. If this is not possible we will, if need be, endeavour to consult the municipality in these matters and find a solution thereto.

- (d) The principle of spatial resilience, whereby flexibility in spatial plans, policies and land use management systems are accommodated to ensure sustainable livelihoods in communities most likely to suffer the impacts of economic and environmental shocks.

Relevance: This component is applicable to public entities such as municipalities and government departments, it is therefore not the responsibility of an applicant to adhere thereto.

- (e) The principle of good administration, whereby –

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

Relevance: This component is applicable to public entities such as municipalities and government departments, it is therefore not the responsibility of an applicant to adhere thereto.

- (ii) All government departments must provide their sector inputs and comply with any other prescribed requirements during the preparation or amendment of spatial development frameworks;

Relevance: This component is applicable to public entities such as municipalities and government departments, it is therefore not the responsibility of an applicant to adhere thereto.

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

Relevance: Various approvals/ no objections/ authorisations had to be obtained in relation to the proposed residential development and they are as follow:

- *Environmental Authorisation: The final scoping report (Annexure J) has been submitted to DENC. The processing of the application has been limited, due to the Covid-19 protocols that have been enforced by the Department of Environment and Nature Conservation. This application for land use change is therefore submitted without the EA;*

- *DRPW: The Department of Roads and Public Works has been furnished with a formal notification letter (Annexure L) for review on the 8th of October 2020. The formal response form DRPW will be presented to the !Kheis Municipality upon receipt thereof;*
- *Sanral: SANRAL: SANRAL has been furnished with a formal notification letter (Annexure K) for review on the 13th of October 2020. The formal response form Sanral will be presented to the !Kheis Municipality upon receipt thereof;*

The !Kheis Municipality has granted permission to submit this application and commence with the public participation process without the Environmental Authorisation, Sanral and DRPW no-objection. It should however be noted that this application will not proceed beyond the public participation process until the environmental authorisation and DRPW no-objection have been obtained. Kindly note that the involved property is registered in the ownership of the !Kheis Municipality and therefore the input from the Department of Agriculture is not required.

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

Relevance: The Land Use Management Scheme of the !Kheis Local Municipality stipulates that the applicant (in this case our office) will be responsible for the application procedures that is to follow the submission of an application. Our office takes public participation very seriously and will follow all the by-law stipulations very closely to ensure full compliance, which will result in a completely transparent process.

- (v) Policies, legislation and procedures must be clearly set in order to inform and empower members of the public.

Relevance: This component is applicable to public entities such as municipalities and government departments; it is therefore not the responsibility of an applicant to adhere thereto.

2. PLANNING CONSIDERATIONS

2.1. LOCATION OF STUDY AREA

The !Kheis Municipality is situated in the central sections of the Northern Cape Province, within the ZF Mgcawu District Municipality, and may be described as being one of the northernmost municipalities in the province. The urban heart of the municipality may be described as being Groblershoop, which is located in the north-eastern sections of the municipality on the banks of the Orange River.

This application for land use change pertains to the small rural town of Wegdraai, with this settlement situated in the south-eastern section of the !Kheis Local Municipality. Wegdraai is furthermore located next to the N10 national road and approximately 15km north-west of Groblershoop. The study area of this application consist of portions of three registered land units, therefore the locality of these portions can best be described as outlining the existing town of Wegdraai. The coordinates



involved land portions can be seen on the image below:



Please refer to the figures attached to this submission for a visual interpretation regarding the locality of the study area.

2.2. PHYSIOGRAPHY

The physiography of the area within which the study area is located is discussed briefly.

2.2.1. TOPOGRAPHY

The proposed Wegdraai formalisation and expansion project necessitated the completion of numerous specialist studies that inform the Environmental Impact Assessment. The assessment has scrutinised the area earmarked for expansion, thereby addressing the physiography in more detail. The draft scoping report, as well as other specialist studies, are attached as Annexures to this submission. No problems are anticipated in this regard.

2.2.2. SOIL/GEOLOGICAL CONDITIONS

The undertaking of a geotechnical investigation was required for the Wegdraai formalisation and expansion project. The Geological Report (Annexure G) concluded that the study area is intermediately suitable for normal township expansion, with the study area being classified under geotechnical zones I, II & III. These geotechnical zones have intermediate development

potential and the construction type thereof is normal. No problems are expected in this regard.

2.2.3. FAUNA AND FLORA

The proposed Wegdraai formalisation and expansion project necessitated the completion of numerous specialist studies that inform the Environmental Impact Assessment. It is worth mentioning that the Botanical Assessment (See Annexure I) identified numerous protected species and proposes that a NFA permit, as well as a NCNCA permit be acquired for the removal of these species.

The draft scoping report, as well as other specialist studies, are attached as Annexures to this submission. No problems are anticipated in this regard.

2.3. INTEGRATED PLANNING

The Spatial Planning and Land Use Management Act (Act 16 of 2013) stipulates that each Municipality must prepare a spatial development framework (SDF) that interprets and represents the spatial development vision of the competent Authority. All proposed developments, specifically pertaining to land use change applications within a municipality, must be measured against an approved Spatial Development Framework (SDF) of such a municipality, which may be seen as the spatial translation of the Integrated Development Plan (IDP). The planning legislation states that no land development decision can be made if the proposed development is inconsistent with the municipal spatial development framework. However, the District Municipal Planning Tribunal may depart from the provisions of the SDF only if site-specific circumstances justify a departure from the provisions of such SDF, as envisaged in §22 (2).

!KHEIS SPATIAL DEVELOPMENT FRAMEWORK:

The !Kheis SDF was revised in 2016 to align with the principles of the Spatial Planning and Land Use Management Act (Act 16 of 2013) and has since been a valid and weight bearing document for spatial guidance. The SDF of the !Kheis Municipality adheres to the basic SDF requirements as stipulated in the Spatial Planning and Land Use Management Act (Act 16 of 2013), therefore providing a potential investor with adequate information to plan a development according to the spatial vision of the municipality.

Within the !Kheis SDF, the portions of land identified for the Wegdraai formalisation and expansion project falls within the urban edge of Wegdraai and has furthermore been earmarked (See Annexure N) for low-cost housing, as such the development proposal is in line with the spatial vision of Wegdraai.

2.4. CHARACTER OF THE AREA

As mentioned throughout this report, the study area comprise of land portions, which serve as the town commonage of Wegdraai and is located on the periphery of this town. This locale contributes to a strong contrast between vacant areas and built-up areas. An estimate of 200 informal stands can also be located on the involved portions of land. All of the land portions that translate to the study area of this application borders to the existing developments of Wegdraai. The development proposal will therefore fit well in with the existing residential character brought forth by the existing town of Wegdraai.

2.5. INFRASTRUCTURE

2.5.1. WATER

BVI Consulting Engineering has been appointed to conduct a detailed services report (Annexure D) for Wegdraai formalisation and expansion project. The services report investigated the current bulk services capacity, determined the needed upgrades to accommodate the proposed expansion project and sought solutions to obtain the required funding to implement the necessary upgrades to the bulk services infrastructure. The findings of the services report for the provision of this service are as follow:

“In conclusion, the engineering services are not in place (water and sewer) to meet the standard requirements. The infrastructure will have to be upgraded regardless of the implementation of the Wegdraai 360 houses development in order to meet current and expected future needs. The upgrading should be done in such a way as to take into consideration the Wegdraai 360 Houses development.”

Kindly refer to the services report for more detail on the proposed upgrading of municipal infrastructure.

Funding can be applied for through the Municipal Infrastructure Grant (MIG) and Regional Bulk Infrastructure Grant (RBIG). For repair work at the water treatment works, the Water and Sanitation Infrastructure Grant (WSIG) can also be applied for.

2.5.2. SEWERAGE

BVI Consulting Engineering has been appointed to conduct a detailed services report (Annexure D) for Wegdraai formalisation and expansion project. The services report investigated the current bulk services capacity, determined the needed upgrades to accommodate the proposed expansion project and sought solutions to obtain the required funding to implement the necessary upgrades to the bulk services infrastructure. The findings of the services report for the provision of this service are as follow:

“In conclusion, the engineering services are not in place (water and sewer) to meet the standard requirements. The infrastructure will have to be upgraded regardless of the implementation of the Wegdraai 360 houses development in order

to meet current and expected future needs. The upgrading should be done in such a way as to take into consideration the Wegdraai 360 Houses development.”

Kindly refer to the services report for more detail on the proposed upgrading of municipal infrastructure.

Funding can be applied for through the Municipal Infrastructure Grant (MIG) and Regional Bulk Infrastructure Grant (RBIG). For repair work at the water treatment works, the Water and Sanitation Infrastructure Grant (WSIG) can also be applied for.

2.5.3. ELECTRICITY

BVI Consulting Engineering has been appointed to conduct a detailed services report (Annexure D) for Wegdraai formalisation and expansion project. The services report investigated the current bulk services capacity, determined the needed upgrades to accommodate the proposed expansion project and sought solutions to obtain the required funding to implement the necessary upgrades to the bulk services infrastructure. The findings of the services report for the provision of this service are as follow:

“In conclusion, the engineering services are not in place (water and sewer) to meet the standard requirements. The infrastructure will have to be upgraded regardless of the implementation of the Wegdraai 360 houses development in order to meet current and expected future needs. The upgrading should be done in such a way as to take into consideration the Wegdraai 360 Houses development.”

Kindly refer to the services report for more detail on the proposed upgrading of municipal infrastructure.

Funding can be applied for through the Municipal Infrastructure Grant (MIG) and Regional Bulk Infrastructure Grant (RBIG). For repair work at the water treatment works, the Water and Sanitation Infrastructure Grant (WSIG) can also be applied for.

2.5.4. STORM WATER

Storm water drainage will take place above ground, in natural furrows and along the streets of the proposed layout. The layout plan has been designed to accommodate all storm water furrows identified in the Freshwater Report, as well as align with the general topography of the development site. No Problems are expected in this regard.

2.5.5. ROAD NETWORK

The Wegdraai formalisation and expansion layout exhibits an extended internal road network that functionally link with the existing road network of Wegdraai. The proposed residential development will effectively link with the existing road network of Wegdraai via numerous connections. The existing collector and arterial roads of Wegdraai will extent into applicable portions of land, which forms the development site of this application. A hierarchy of road types have been

designed throughout the planned town planning layout, in order to promote accessibility and mobility.

As per the attached layout plane (Figure 7) three direct accesses to the provincial road that borders Wegdraai to the north have been requested from DRPW. DRPW has been informed of the Wegdraai formalisation and expansion project, as well as the connections to the provincial roads, and their formal response will be furnished to the !Kheis Municipality and ZF Mgcawu District Municipality upon receipt thereof. It is anticipated that a traffic impact assessment and detail engineering plans will be upheld as conditions to approval. Sanral has also been informed of the planned housing project, since the N10 borders Erf 45, Wegdraai to the east. A 30m buffer between the development site and the N10 has been proposed. The formal response from Sanral will be furnished to the !Kheis Municipality and ZF Mgcawu District Municipality upon receipt thereof.

2.6. SIZE, ZONINGS AND REGULATIONS

The development site pertains to portions of Erven 1, 45 & 47, Wegdraai, Kenhardt RD, !Kheis Municipality, Northern Cape Province, and cover a total area of 33ha. The !Kheis Local Municipality is the registered owners of all the properties involved in this submission. The applicable portion of Erf 1, Wegdraai is zoned as Open Space Zone III, whilst the portion of land applicable to Erven 45 and 47, Wegdraai hold an Undetermined Zone zoning, in terms of the newly adopted !Kheis Land Use Management Scheme. Large portions of Erven 45 & 47, Wegdraai are being occupied by informal stands, whilst the portion of Erf 1, Wegdraai is vacant.

It should be noted that Erven 45 & 47, Wegdraai have been subject to processes of land use change in the past, with the purpose of formalising informal stands. The registration of these erven were completed at office of the Chief Surveyor General, but the registration at the Deeds Office was never finalised. As it stands Erven 45 & 47, Wegdraai are still the registered properties in terms of ownership at the Deeds Office.

The purpose of this application is to obtain the approval of the necessary land use changes needed for the formalisation of existing informal residential properties, provide additional erven for future population growth and provide supportive uses, such as institutional, business and municipal uses.

The following land use changes have to be followed:

1. CONSOLIDATION (See Figure 5):

- 1.1. Consolidation of Erf 45 & 47, Wegdraai into an individual land unit. Please note that the proposed consolidation of these properties will not adversely affect the previous subdivisions that took place thereon. The existing surveyed properties that were subdivided from Erven 45 & 47, Wegdraai have not been changed.

2. SUBDIVISION (See Figure 6):

- 2.1. Subdivision of the newly consolidated land unit and the applicable portion of Erf 1, Wegdraai, into 389 individual cadastral land units.



3. REZONING (See Figure 7):

3.1. Rezoning of the newly created properties, thereby allocating appropriate land use rights to each of the newly created individual erven suitable to their future purpose within the Wegdraai formalisation and expansion project. The proposed zonings, in terms of the newly adopted !Kheis Scheme Regulations, are as follow and should be read together with the final layout plan attached as Annexure E to this submission:

<u>Zoning</u>	<u>Primary Use/s</u>	<u>Erven Amount</u>
<u>Residential Zone I</u>	<u>Residential House</u>	<u>364</u>
<u>Business Zone I</u>	<u>Business Premises</u>	<u>3</u>
<u>Institutional Zone II</u>	<u>Place of Worship</u>	<u>2</u>
<u>Open Space Zone II</u>	<u>Public Open Spaces</u>	<u>6</u>
<u>Transport Zone I</u>	<u>Public Street</u>	<u>6</u>
<u>Authority Zone I</u>	<u>Municipal Uses</u>	<u>1</u>
<u>Undetermined Zone</u>	<u>Undetermined</u>	<u>7</u>
<u>Total</u>		<u>389</u>

Please refer to Figures 5 & 6, Annexure E, §2.8 & §3.3 of this report for more information in this regard

The title deed of the involved properties has been scrutinised to determine if there are any restrictive conditions that needs to be removed in order for the land use change processes to take place. No such restrictive title deed conditions have been found within the title deeds of the involved properties (Annexure A).

In order to achieve the objective of providing sub-economic housing for the town of Wegdraai, this formal land use change application, pertaining to consolidation, subdivision & rezoning, is submitted to the !Kheis Local Municipality as municipality of first instance. This application for land use change (consolidation, subdivision & rezoning) is therefore submitted to the !Kheis Municipality in order to ensure legal compliance with the clear context of the Spatial Planning and Land use Management Act (Act 16 of 2013).

2.7. SUMMARY

During the consideration of the approval of this application, it is necessary to keep the following in mind:

- This application is in line with the principles set out in Chapter 2, §7 of the Spatial Planning and Land Use Management Act, Act 16 of 2013;*
- This application complies with the provisions of the !Kheis Land Use Management Scheme;*
- Addresses the backlog of housing as encountered within numerous settlements in the Northern Cape Province;*
- This application complies with the general principles as prescribed in Chapter 1 of the Spatial Planning and Land Use Management Act (Act 16 of 2013);*
- The proposed Wegdraai formalisation and expansion project aligns with the provisions of the !Kheis SDF;*

2.8. LAYOUT PRINCIPLES

LOW-COST HOUSING

The Wegdraai formalisation and expansion project will make provision for 364 sub economic properties, ranging between 300m² to 350m². A small fraction of the development scope will cater to middle-income housing, which will provide much needed income tax to the local municipality.

RELOCATION OF EXISTING INFORMAL STANDS

Most of the existing informal stands will be accommodated within the proposed layout plan, however a few of the informal properties will have to be relocated. This is brought about by the position of informal stands within registered streets, as well as the formation of erven that doesn't allow for a coherent town planning layout.

SUPPORTING LAND USES

The Wegdraai formalisation and expansion project proposes only a few additional land uses, as requested by the community during the community engagement with the !Kheis Local Municipality. These uses include ad hoc business premises on collector or arterial roads, religious properties and a municipal properties for uses such as a community hall.

STORM WATER FURROWS

The study area is being traverse by faint storm water furrows that have been adequately accommodated within the town planning layout, by means of the internal road network and public open spaces.

ROAD NETWORK

The Wegdraai formalisation and expansion layout exhibits an extended internal road network that functionally link with the existing road network of Wegdraai. The proposed residential development will effectively link with the existing road network of Wegdraai via numerous connections. The existing collector and arterial roads of Wegdraai will extent into applicable portions of land, which forms the development site of this application. A hierarchy of road types have been designed throughout the planned town planning layout, in order to promote accessibility and mobility.

As per the attached layout plane (Figure 7) three direct accesses to the provincial road that borders Wegdraai to the north have been requested from DRPW. DRPW has been informed of the Wegdraai formalisation and expansion project, as well as the connections to the provincial roads, and their formal response will be furnished to the !Kheis Municipality and ZF Mgcau District Municipality upon receipt thereof. It is anticipated that a traffic impact assessment and detail engineering plans will be upheld as conditions to approval. Sanral has also been informed of the planned housing project, since the N10 borders Erf 45, Wegdraai to the east. A 30m buffer between the development site and the N10 has been proposed. The formal response from Sanral will be furnished to the !Kheis Municipality and ZF Mgcau District Municipality upon receipt thereof.

3. PROPOSED LAND USE CHANGE

3.1. PLANNING APPROACH

During the motivation of the project, the following objectives were kept in mind:

- ❖ *Addressing housing backlog and providing housing opportunity for the future population growth of Groblershoop;*
- ❖ *The physiography, as evident by the findings of the geotechnical report, botanical Assessment report and the freshwater report, of the area is capable to accommodate the planned housing development;*
- ❖ *Formalising existing informal stands situated within the town of Wegdraai;*
- ❖ *Providing supporting land uses that will contribute to a sustainable community;*
- ❖ *Incorporating land uses derived by community engagement with the !Kheis Municipality;*
- ❖ *Complying with any provisions that the Municipality may enforce on the application;*
- ❖ *The proposed layout complies with the findings and recommendations of the specialist studies.*

3.2. PUBLIC PARTICIPATION

As contemplated in SPLUMA, a land use change implies an amendment to the Scheme and where an amendment to a scheme is to be considered, according to §28(2), a public participation process must be undertaken to ensure that all affected parties have the opportunity to make representations on, object to and appeal the decision. For the purpose of land use applications in the !Kheis Municipality at this stage, we will be guided by the requirements of the municipality, and we anticipate this to include:

1. Notice placed in local print media, which will be followed by a limited period (30 days) within which any member of public may provide inputs and/or objections to this development at the offices of the local municipality. No late inputs will be considered relevant with the cut-off date being clearly indicated in the public notice.
2. The same notice published in the local print media will be placed at the entrance to the involved property, at the same time as publication, allowing an expanded audience to be reached by the notice.
3. The said notice will be forwarded to the surrounding land owners via registered mail or hand delivery, further expanding the audience for inputs.

Should any inputs be received at the offices of the !Kheis Municipality, it would be the responsibility of the receiving official to place the date stamp of the municipality on the received input, proving that it was acquired within the limited timeframe. Upon the closure of the public participation period, any inputs received must be forwarded to the applicant whereupon the applicant will have a maximum of 30 days to provide a written response to the inputs. The application will then be forwarded to the decision-making body for consideration.

3.3. PROPOSED LAND USES

After approval, the following land uses will be established on the study area in terms of the !Kheis Land Use Management Scheme – Please refer to Figure 7 for the layout plan with appropriate zoning notations:

Residential Zone I	Indication on map: colour	Yellow	
	Primary use/s	Dwelling House / Residential House	Means a building containing only one residential unit – a self-contained interlinking group of rooms for the accommodation and housing of a single family, or a maximum of four persons who do not satisfy the definition of a “family”, together with such outbuildings as are ordinarily used therewith.

364 land units created will be given this zoning with the objective of addressing housing backlog, as well as make provision for future population growth.

Business Zone I	Indication on map: colour	Red	
	Primary use/s	Business Building / Premises	Means a site and/or building or part thereof used or intended to be used as shops and/or offices and it includes hotels, restaurants, dry-cleaners, financial institutions, professional offices, places of assembly, doctors consulting rooms, stock or product exchanges, put-put course, flats above ground floor and buildings for similar uses, but it excludes bottle stores, taverns, places of entertainment, a casino, adult entertainment, institutional buildings, funeral parlours, public garages, service stations, repairing or related replacing functions, industrial buildings, offensive industries, heavy vehicle overnight facilities or any wholesale business.

3 land units created will be given this zoning within the layout, providing economic prosperity to the residents of the proposed community.

Institutional Zone II	Indication on map: colour	Light Blue	
	Primary use/s	Place of Worship	Means a church, synagogue, mosque, temple, chapel or other place for practising religion. This includes any building in connection therewith, for instance a hall, Sunday school classes or parsonage, but does not include funeral parlours (Office & Facility), including chapels forming part of such funeral parlours;

2 land units created will be given this zoning within the layout, providing religious properties for the residents of the proposed community.

Open Space Zone II	Indication on map: colour	Green	
	Primary use/s	Public open space	Means any land which falls under, or is intended to come under the ownership of the local authority, which is not leased or intended to be leased on a long-term basis, and which is utilised by the public as an open space, park, garden, picnic site, square, playground or recreational site, whether it appears on an approved general plan or not.

6 land units created will be given this zoning within the layout, accommodating storm-water furrows & site topography.

Transport Zone I	Indication on map: colour	Light Grey	
	Primary use/s	Public Street	Means any land indicated on a plan or diagram or is specified within this zoning scheme, reserved for street purposes and where the ownership as such vests in a competent authority and includes facilities for public transport.

6 land unit created will be given this zoning within the layout, accommodating the internal road network.

Authority Zone I	Indication on map: colour	Light Red	
	Primary use/s	Municipal Use	Means land/erven and buildings utilised by Local and District Municipality to carry out its mandatory functions, of which the extent thereof is of such nature that is cannot be classified or defined under any other usage in these regulations and include uses such as stores, warehouses, cemeteries, commonage, nursery, waste disposal site and water purification works, etc. The land/erven zoned for this purpose must be registered in the name of the Municipality.

1 land unit created will be given this zoning within the layout, providing community related uses.

Undetermined Zone	Indication on map: colour	Red squares	
	Primary use/s	Undetermined	Referred to properties previously zoned 'undetermined' or other abolished zones in previous schemes which cannot be appropriately converted to a new use zone;

1 land unit created will be given this zoning within the layout, providing community related uses.

4. RECOMMENDATION

It is thus evident from the previous discussions that this application for land use change (Consolidation, Subdivision and Rezoning) for formalisation and expansion for Wegdraai is desirable for development within the !Kheis Local Municipality and should be positively considered for approval by the JMPT.

4.1. APPROVAL OF THE APPLICATION

The !Kheis Municipality is therefore requested to:

1. Give the go-ahead for advertising the application according to and in terms of the procedures adopted by themselves as part of their commitment to the provisions of the Spatial Planning and Land Use Management Act, Act 16 of 2013. The public participation process will be handled by this office and proof thereof will be sent to the Municipality.
2. Communicate the relevant Administrative fee to this office after accepting the application and stipulating its requirements.
3. Recommend the approval of this land use application to the JMPT after the closure of the public participation process.

The JMPT is therefore requested to:

1. Favourably consider this application for subdivision, consolidation and rezoning by means of approving it in terms of the recommendation from the office of the !Kheis Municipality.

Figure 4: Consolidation

Property Description:

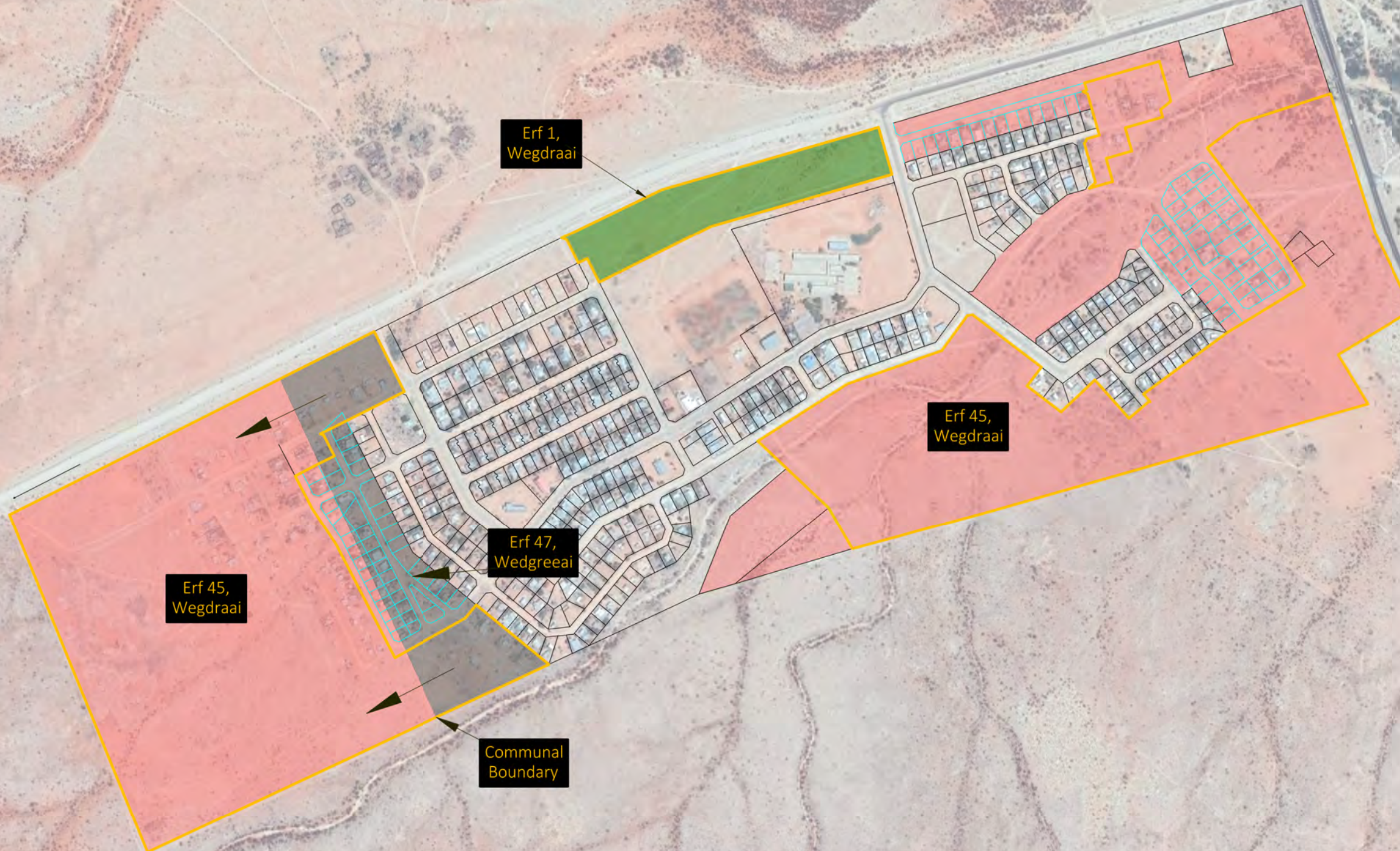
Erf 1, Wegdraai, !Kheis Municipality, Kenhardt RD, Northern Cape Province;

Erf 45, Wegdraai, !Kheis Municipality, Kenhardt RD, Northern Cape Province;

Erf 47, Wegdraai, !Kheis Municipality, Kenhardt RD, Northern Cape Province.

Legend:

- Erf 1, Wegdraai
- Erf 45, Wegdraai
- Erf 47, Wegdraai to be consolidated with Erf 45, Wegdraai
- Study Areas
- Surveyed Erven



Wegdraai

Municipality:



Private Bag X2,
Groblershoop
8850

Tel: 054 833 9500
Fax: 054 833 9509

Consultant:



MACROPLAN
TOWN & REGIONAL PLANNERS
YOUR PARTNERS IN PROFESSIONAL PLANNING SERVICES

054 332 3642
4A Murray Avenue, Upington 8801 macroplan@mweb.co.za
PO Box 987, Upington 8800 www.macroplan.info

Reference

(FIG5.SUB.REZ.CON) 201022 Erf 1, 45 & 47, Wegdraai

Designed

JP Theron (A/2394/2016)

Date

October 2020

Drawn

JP Theron (A/2394/2016)

Scale

1: 6000

Title: Figure 5: Proposed Subdivision for Housing Project

Property Description:
Erf 1, Wegdraai, !Kheis Municipality, Kenhardt RD, Northern Cape Province;
Erf 45, Wegdraai, !Kheis Municipality, Kenhardt RD, Northern Cape Province;
Erf 47, Wegdraai, !Kheis Municipality, Kenhardt RD, Northern Cape Province.

- Legend:
- Study Area
 - Existing Cadastral
 - Subdivision Lines

A total of 389 individual land units will be created

Municipality:


!Kheis
Munisipaliteit
Municipality

Private Bag X2,
Groblershoop
8850

Tel: 054 833 9500
Fax: 054 833 9509

Consultant:


MACROPLAN
TOWN & REGIONAL PLANNERS
YOUR PARTNERS IN PROFESSIONAL PLANNING SERVICES

054 332 3642
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PO Box 987, Upington 8800 www.macroplan.info

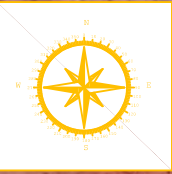
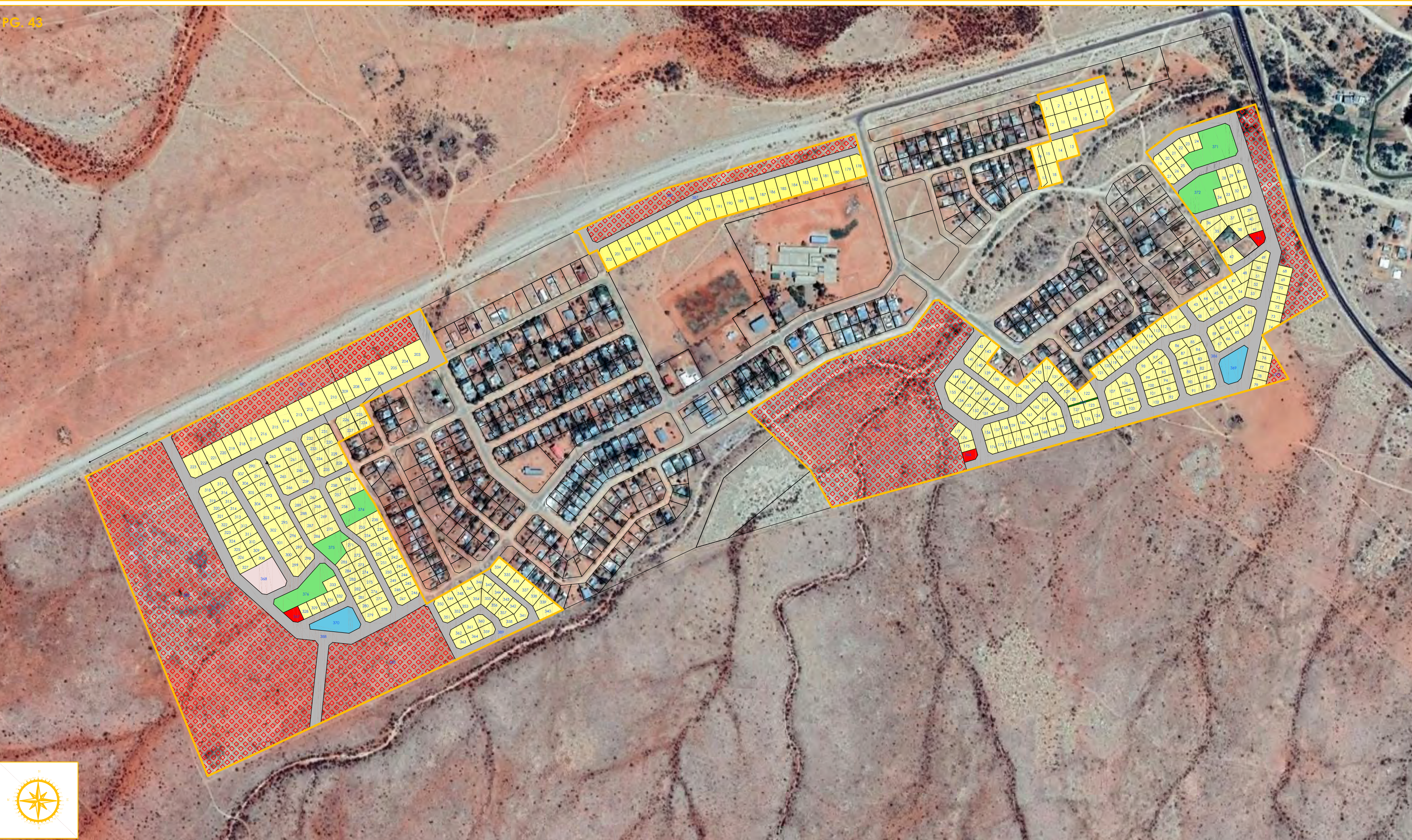
Reference: (FIG6.SUB.REZ.CON) 201022 Erf 1, 45 & 47, Wegdraai

Designed: JP Theron (A/2394/2016) Date: October 2020

Drawn: JP Theron (A/2394/2016) Scale: 1: 6000

Wegdraai





**FIGURE 6:
PROPOSED
SUBDIVISION**

Design: JP Theron (Pr. Pln. A/2394/2016)
Drawn: JP Theron (Pr. Pln. A/2394/2016)
Date: October 2020
Scale: 1:5000
Plan no: (FIGA.CON.SUB.REZ) 201022
Erven 1, 45 & 47, Wegdraai

Proposed Land Uses in terms of Land Use Management System					
Colour & Numbers	Land Use Description	Total Units	Schedule of Sizes		
			average size per plot	total area covered by land use	percentage of study area covered by use
Green	Open Space Zone I				
Light Green	Open Space Zone II	6			
Yellow	Open Space Zone III				
Light Yellow	Agricultural Zone I				
Light Green	Agricultural Zone II				
Light Green	Resort Zone II				
Yellow	Residential Zone I	364	384.6m²	14ha	
Yellow	Residential Zone II				
Yellow	Residential Zone III				
Yellow	Residential Zone IV				
Yellow	Residential Zone V				
Yellow	Residential Zone VI				
Blue	Institutional Zone I				
Blue	Institutional Zone II	2			
Blue	Institutional Zone III				
Blue	Authority Zone I	1			
Blue	Authority Zone II				
Blue	Special Zone				
Red	Business Zone I	3			
Red	Business Zone II				
Red	Business Zone III				
Red	Business Zone IV				
Red	Business Zone V				
Red	Business Zone VI				
Red	Industrial Zone I				
Red	Industrial Zone II				
Red	Industrial Zone III				
Red	Industrial Zone IV				
Red	Industrial Zone V				
Red	Industrial Zone VI				
Red	Utility Zone I				
Red	Utility Zone II				
Red	Utility Zone III				
Red	Transport Zone I	6			
Red	Transport Zone II				
Red	Transport Zone III				
Red	Total:	389			34ha

Property Description:

Erf 1, Wegdraai, !Kheis Municipality, Kenhardt RD, Northern Cape Province;

Erf 45, Wegdraai, !Kheis Municipality, Kenhardt RD, Northern Cape Province;

Erf 47, Wegdraai, !Kheis Municipality, Kenhardt RD, Northern Cape Province.

MACROPLAN
TOWN & REGIONAL PLANNING

JP THERON
PR. PLN. A/2394/2016
T: 054 332 3642 • C: 082 821 1024
E: jptheron@macroplan.co.za

Head Office:
4A Murray Avenue, Uptington 8801

Kimberley Office:
4 Homestead Way, Kimberley 8301

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Kimberley Office:
4 Homestead Way, Kimberley 8301



Municipality:

!Kheis
Municipality

Private Bag X2,
Groblershoop
8850

Tel: 054 833 9500
Fax: 054 833 9509

Client:

COGHSTA
Department of Cooperative Governance
HUMAN SETTLEMENTS & TRADITIONAL AFFAIRS
NORTHERN CAPE

ANNEXURE A: COPY OF TITLE DEED



WALKERS INC.

Takophone (021) 464 1400

Opgestel deur my

AKTEBESORGER
DE VILLIERS, P J DE B

AKTEBESORGER
DE VILLIERS, P J DE B

SEEKING
DUTY R.....
FOOI
FEE R.....

100-443886-1000

T 036416 / 2002

AKTE VAN TRANSPORT

MALAN & VENNOTE
SCHRODERSTRAAT 25
UPINGTON
8800
POSBUS 27 UPINGTON 8800
(054) 3321127/8/9

HIERMEE WORD BEKEND GEMAAK

DAT

voor my **REGISTRATEUR VAN AKTES** te KAAPSTAD verskyn het, die genoemde komparant synde behoorlik daartoe gemagtig deur 'n Volmag aan hom/haar verleen deur:

PROVINSIE NOORD-KAAP

geleëteer die 26ste November 2001 en geteken te KIMBERLEY

EN die genoemde Komparant het verklaar dat PROVINSIE NOORD-KAAP die ondergemelde eiendom op 9 Julie 2001 waarlik en wettiglik per PRIVATE OOREENKOMS verkoop het en dat hy/sy in sy/haar voormelde hoedanigheid hierby sedeer en transporteer aan en ten gunste van:

MUNISIPALITEIT !KHEIS

die se opvolgers in titel of regverkrygendes, in volkome en vrye eiendom,

1. RESTANT ERF 45 WEGDRAAI

GELEE in die Munisipaliteit !KHEIS, Afdeling Kenhardt, Provinsie Noord-Kaap

GROOT 48,5913 (AGT EN VEERTIG KOMMA VYF NEGE EEN DRIE) hektaar

AANVANKLIK GEREISTREER kragtens Sertifikaat van Verenigde Titel Nr T16779/1977 met Kaart LG Nr 7063/1974 wat daarop betrekking het

EN GEHOU kragtens Transportakte T11369/1994

2. RESTANT ERF 47 WEGDRAAI

GELEE in die Munisipaliteit !KHEIS, Afdeling Kenhardt, Provinsie Noord-Kaap

GROOT 4,7131 (VIER KOMMA SEWE EEN DRIE EEN) hektaar

AANVANKLIK GEREISTREER EN GEHOU kragtens Sertifikaat van Gereistreeerde Titel Nr T6850/2001 met Kaart LG Nr 964/1998 wat daarop betrekking het

3. RESTANT ERF 68 WEGDRAAI

GELEE in die Munisipaliteit !KHEIS, Afdeling Kenhardt, Provinsie Noord-Kaap

GROOT 1,5083 (EEN KOMMA VYF NUL AGT DRIE) hektaar

AANVANKLIK GEREISTREER EN GEHOU kragtens Sertifikaat van Gereistreeerde Titel Nr T6851/2001 met Kaart LG Nr 965/1998 wat daarop betrekking het

WESHALWE die Komparant afstand doen van al die reg en titel wat die gesegde
PROVINSIE NOORD-KAAP voorheen in die genoemde eiendom gehad het en
gevolglik ook erken dat dit geheel en al uit die besit daarvan onthef is en nie meer
daartoe geregtig is en dat kragtens hierdie akte, die genoemde

MUNISIPALITEIT IKHEIS

die se opvolgers in titel of regverkrygendes tans en voortaan daartoe geregtig is,
ooreenkomstig plaaslike gebruik, behoudens die Regte van die Staat en erken dit
ten slotte dat die koopprys van die eiendom wat hiermee getranspoteer word die
bedrag van R1,00 (EEN RAND) is.

IN GETUIENIS WAARVAN EK, die genoemde REGISTRATEUR VAN AKTES tesame
met die Komparant, q.q. hierdie Akte onderteken het en met my Ampseël
bekragtig het.

ALDUS GEDOEN EN GETEKEN op die kantoor van die REGISTRATEUR VAN
AKTES te KAAPSTAD op 10 Mei 2002

In my teenwoordigheid


REGISTRATEUR VAN AKTES

q.q.

56

WALVERS INC.

Telephone (021) 484-1400

Opgestel deur my

my Mrs de Villiers
AKTEBESORGER
DE VILLIERS, P J DE B

55.00

4-11 L MURIE

ISSUED FOR INFORMATION ONLY
ALLEN YET INFORMASIE DOLENDIG VERREKEN

AKTE VAN TRANSPORT

MA 11 11 11 NOTE
SCHAKELSTRAAT 25
UPINGTON
8800
POSBUS 27 UPINGTON 8800
(054) 332112 / 319

084788/2002

HIERMEE WORD BEKEND GEMAAK

DAT

voor my REGISTRATEUR VAN AKTES te KAAPSTAD verskyn het, die genoemde
komparant synde lehoorlik daartoe gemagtig deur 'n Volmag aan hom/haar
verleë deur:

SIYANDA DISTRIK MUNISIPALITEIT

gedateer die 25ste Maart 2002 en geteken te UPINGTON

EN die genoemde Komparant het verklaar dat SIYANDA DISTRIK MUNISIPALITEIT die ondergemelde eiendom op 25ste Maart 2002 waarlik en wettiglik per PRIVATE OOREENKOMS verkoop het en dat hy/sy in sy/haar voormelde hoedanigheid hierby sedeer en transporteer aan en ten gunste van:

!KHEIS MUNISIPALITEIT

die se opvolgers in titel of regverkrygendes, in volkome en vrye eiendom,

1. RESTANT ERF 39 WEGDRAAI

GELEE in die Munisipaliteit !KHEIS, Afdeling Kenhardt, Provinsie Noord-Kaap

waarop uitgelê is Algemene Plan Nr 972/1998

GROOT 6666 (Sesduisend Seshondr d Ses en Sestig) vierkante meter;

AANVANKLIK GEREGISTREER EN GEHOU kragtens Sertifikaat van Geregistreerde Titel T6852/2001 met Algemene Plan TP 10266 wat daarop betrekking het

ONDERHEWIG aan die voorwaardes soos vervat in Artikel 47 (c) van die Akteswet Wet 47/1937 dat die binnegemelde eiendom as 'n dorp ingedeel is en dat dit onderworpe bly aan die Wetsbepalings op dorpe

2. RESTANT ERF 241 WEGDRAAI

GELEE in die Munisipaliteit !KHEIS, Afdeling Kenhardt, Provinsie Noord-Kaap

waarop uitgelê is Algemene Plan Nr 972/1998

GROOT 704 (Sewehonderd en Vier) vierkante meter;

AANVANKLIK GEREGISTREER EN GEHOU kragtens Sertifikaat van Geregistreerde Titel T6852/2001 met Kaart Nr 968/1998 wat daarop betrekking het

158 0 100 INFORMATION ONLY
ALGEMEENES REGISTREERINGS- EN METINGS-UITREKSEL

GA

ONDERHEWIG aan die voorwaardes soos vervat in Artikel 47 (c) van die Akteswet Wet 47/1937 dat die binnegemelde eiendom as 'n dorp ingedeel is en dat dit onderworpe bly aan die Wetsbepalings op dorpe

3. RESTANT ERF 1 WEGDRAAI

GELEE in die Munisipaliteit !KHEIS, Afdeling Kenhardt, Provinsie Noord-Kaap

GROOT 8,2767 (Agt komma Twee Sewe Ses Sewe) hektaar

AANVANKLIK GEREISTREER EN GEHOU kragtens Sertifikaat van Gereistreerde Titel T6854/2001 met Kaart Nr 1412/1998 wat daarop betrekking het

4. ERF 391 WEGDRAAI

GELEE in die Munisipaliteit !KHEIS, Afdeling Kenhardt, Provinsie Noord-Kaap

GROOT 2613 (Tweeduisend Seshonderd en Dertien) vierkante meter

AANVANKLIK GEREISTREER EN GEHOU kragtens Sertifikaat van Gereistreerde Titel T6855/2001 met Kaart Nr 1413/1998 wat daarop betrekking het

5. ERF 392 WEGDRAAI

GELEE in die Munisipaliteit !KHEIS, Afdeling Kenhardt, Provinsie Noord-Kaap

GROOT 2676 (Tweeduisend Seshonderd Ses en Sewentig) vierkante meter

AANVANKLIK GEREISTREER EN GEHOU kragtens Sertifikaat van Gereistreerde Titel T6855/2001 met Kaart Nr 1414/1998 wat daarop betrekking het

FOR INFORMATION ONLY
INFORMASIE DOEL ENDEES INGEROM

6.

ERF 129 GROOTDRINK

GELEE in die Munisipaliteit !KHEIS, Afdeling Kenhardt, Provinsie Noord-Kaap

GROOT 10,2442 (Tien komma Twee Vier Vier Twee) hektaar:

AANVANKLIK OORGEDRA EN GEHOUD krachtens Grondbrief T12737/1977 met Kaart Nr 10598/1973 wat daarop betrekking het

ONDERWORPE aan Sertifikaat van Minerale Regte nr 11/1958 geregistreer 26 November 1958.

HIERDIE TOEKENNING geskied verder behoudens die volgende voorwaardes:-

- (a) Alle regte op edelgesteentes, edelmetale, onedele minerale en aardolie soos in die mineraalwette omskryf op of onder die grond word vir die Staat voorbehou.
- (b) Die eiendom mag slegs vir die doeleindes van 'n steenmakery, wat ook die tydelike huisvesting van arbeiders insluit, gebruik word.
- (c) Die terrein moet opgevol en gelykgemaak word nadat grond vir die maak van stene verwyder is; en
- (d) Die 30,48 meter vloedbeskermingsarea vanaf die rivierwal mag nie ontbos en beskadig word nie.

THE UNIVERSITY OF CHICAGO

WESHALWE die Komparant afstand doen van al die reg en titel wat die gesegde SIYANDA DISTRIK MUNISIPALITEIT voorheen in die genoemde eiendom gehad het en gevolglik ook erken dat dit geheel en al uit die besit daarvan onthef is en nie meer daartoe geregtig is en dat kragtens hierdie akte, die genoemde

IKHEIS MUNISIPALITEIT

die se opvolgers in titel of regverkrygendes tans en voortaan daartoe geregtig is, ooreenkomstig plaaslike gebruik, behoudens die Regte van die Staat en erken dit ten slotte dat die koopprys van die eiendom wat hiermee getransporeer word die bedrag van R1.00 (EEN RAND) is.

IN GETUIENIS WAARVAN EK, die genoemde REGISTRATEUR VAN AKTES tesame met die Komparant, q.q. hierdie Akte onderteken het en met my Ampseël bekragtig het.

ALDUS GEDOEN EN GETEKEN op die kantoor van die REGISTRATEUR VAN AKTES te KAAPSTAD op 9 Oktober 2016

In my teenwoordigheid


REGISTRATEUR VAN AKTES

q.q.

Certified a true copy of the original filed of record in this Registry in terms of	
Reg 60	
Deeds Registry Cape Town	11/04/2016
[Signature]	

ANNEXURE B: AUTHORISING DOCUMENTATION



Gauteng (Head Office)

Tel: +27 12 881 0210
Fax: +27 86 476 7573

Building 9 Cambridge Office Park
5 Bauhinia Street, Highveld
Techno Park, Centurion, 0169

North West

Tel: +27 18 468 4876
Fax: +27 86 476 7573

52 Ian Street, Wilkoppies
Klerksdorp, 2571
(PO Box 6468 Flamwood, 2572)

Northern Cape

Tel: +27 53 831 3249
Fax: +27 86 476 7573

Sub Office: Agri Office Park
Building 2, Unit 1
South Kimberly, 8301

Eastern Cape

Tel: +27 43 050 0828
Fax: +27 86 476 7573

Leadwood House, Cedar Square
Bonza Bay Road
Beacon Bay, 5241

Kwazulu-Natal

Tel: +27 31 944 1635
Fax: +27 86 476 7573

Office 15, Ground Floor A Block
BCX Durban 1, 1 Frosterley Crescent
La Lucia Ridge, Umhlanga, 4091

Mpumalanga

Tel: +27 13 590 0952
Fax: +27 86 476 7573

2nd Floor, North Tower Suites 202, 1
Aqua Street, Riverside 1226

Amendment 1 to Appointment

Date : 28 May 2020

To : **Macroplan Town & Regional Planners (Pty) Ltd (Consultant)**
Represented by : *Len Fourie*

From : **Barzani Holdings (Employer)**
Represented by : *Roelof Van Den Berg & Ian Van Der Westhuizen*

Reference: NC/21/2018/PP (Wegdraai 360)

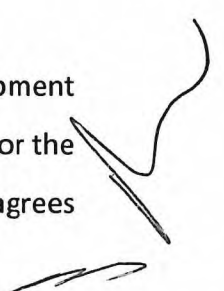
WHEREAS the Employer appointed the Consultant for town planning services at the Wegdraai 360 project.

AND WHEREAS the parties are desirous to change the Employer's name from Barzani Holdings (Pty) Ltd to Barzani Development (Pty) Ltd.

The Parties agree that the provisions of the Appointment will be amended as follows:

1. Amendment

The Parties agree that the Employer be changed to Barzani Development (Pty) Ltd with registration number 2009/001909/07. The signatories for the amended Employer remain the same and the Employer accordingly agrees

Gauteng (Head Office)

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Mpumalanga

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Fax: +27 86 476 7573

2nd Floor, North Tower Suites 202, 1
Aqua Street, Riverside 1226

that the Consultant will by no means be prejudiced by the amendment in any possible way. The signatories waive all rights that Barzani Holdings (Pty) Ltd enjoyed with the original Appointment Letter.

2. General

Save for the amendments and additional provisions stipulated under this amendment, the balance of the provisions and interpretations of the Appointment Letter and all relevant contracts remain to be in full force and effect.

Roelof van den Berg:
Director

Date: 28/05/2020

Ian van der Westhuizen:
Director

Date: 28/05/2020

Herewith do we accept this appointment letter, together with all the terms and conditions

Date:

01-06-2020

Service Provider Representative:

Len J Fourie

Signature:



ANNEXURE C: SG DIAGRAM



SYE	METER	RIGTINGS- HOEKE	KOBORDINATE STELSEL Lo. 21* KONSTANTES			
			Y-80 000,00	X+3 190 000,00	Y	METER X
HOOFFIGUUR						
A B	138,00	243 19 20	A	- 3 775,36	+	1 419,30
B C	263,25	333 19 20	B	- 3 898,67	+	1 357,34
C D	153,68	309 19 10	C	- 4 016,86	+	1 592,57
D E	99,92	219 19 20	D	- 4 135,75	+	1 689,95
E F	143,25	243 19 30	E	- 4 199,07	+	1 612,65
F G	88,56	237 27 40	F	- 4 327,07	+	1 548,34
G H	51,90	313 19 50	G	- 4 401,73	+	1 500,70
H J	96,92	49 45 30	H	- 4 439,48	+	1 536,32
J K	110,51	21 38 20	J	- 4 365,50	+	1 598,93
K M	379,99	64 54 40	K	- 4 324,75	+	1 701,65
M A	488,68	155 09 50	M	- 3 980,61	+	1 862,78

BLOKHOEKE			
47E	- 3 893,65	+ 1 536,69	
47X	- 3 969,61	+ 1 498,52	
48A	- 3 899,49	+ 1 548,30	
54C	- 3 968,97	+ 1 630,91	
59E	- 4 020,77	+ 1 705,65	
60A	- 4 033,15	+ 1 715,79	
60X	- 4 048,99	+ 1 696,45	
66A	- 4 124,18	+ 1 758,03	
68J	- 4 160,74	+ 1 754,12	
68K	- 4 237,40	+ 1 660,54	
68M	- 4 284,22	+ 1 637,02	
68N	- 4 291,27	+ 1 615,73	
71X	- 3 930,77	+ 1 532,59	
82X	- 4 042,95	+ 1 678,57	
86A	- 3 976,95	+ 1 624,52	
92X	- 4 087,01	+ 1 650,03	
106X	- 4 262,51	+ 1 580,78	
107C	- 4 280,47	+ 1 616,52	
107D	- 4 276,02	+ 1 629,94	
110D	- 4 231,01	+ 1 652,56	
117C	- 4 155,61	+ 1 744,61	
118D	- 4 127,28	+ 1 747,64	
122X	- 4 055,33	+ 1 688,71	

VERSEKERINGSMERKE			
VM26	- 3 921,83	+ 1 537,08	
VM27	- 4 036,62	+ 1 686,31	
VM28	- 4 271,45	+ 1 576,29	
VM29	- 3 975,44	+ 1 510,14	
VM30	- 4 074,63	+ 1 639,89	

TRIGONOMETRIESE BAKENS			
28	+ 199,12	+ 5 852,59	
94	- 6 080,00	+ 3 242,92	

BAKENBESKRYWING

B, C, D, E, F, 48a, 48c, 49b, 50b, 53c, 57b, 58a, 59c, 62a, 66b, 66c, 67c, 68j, 71a, 72b, 73b, 75a, 76a, 77a, 82a, 84a, 85a, 85b, 88a, 91a, 95a, 106a, 106b, 107a, 107b, 107d, 107e, 108a, 109a, 109d, 110d, 113a, 113c, 115c, 116c, 118d

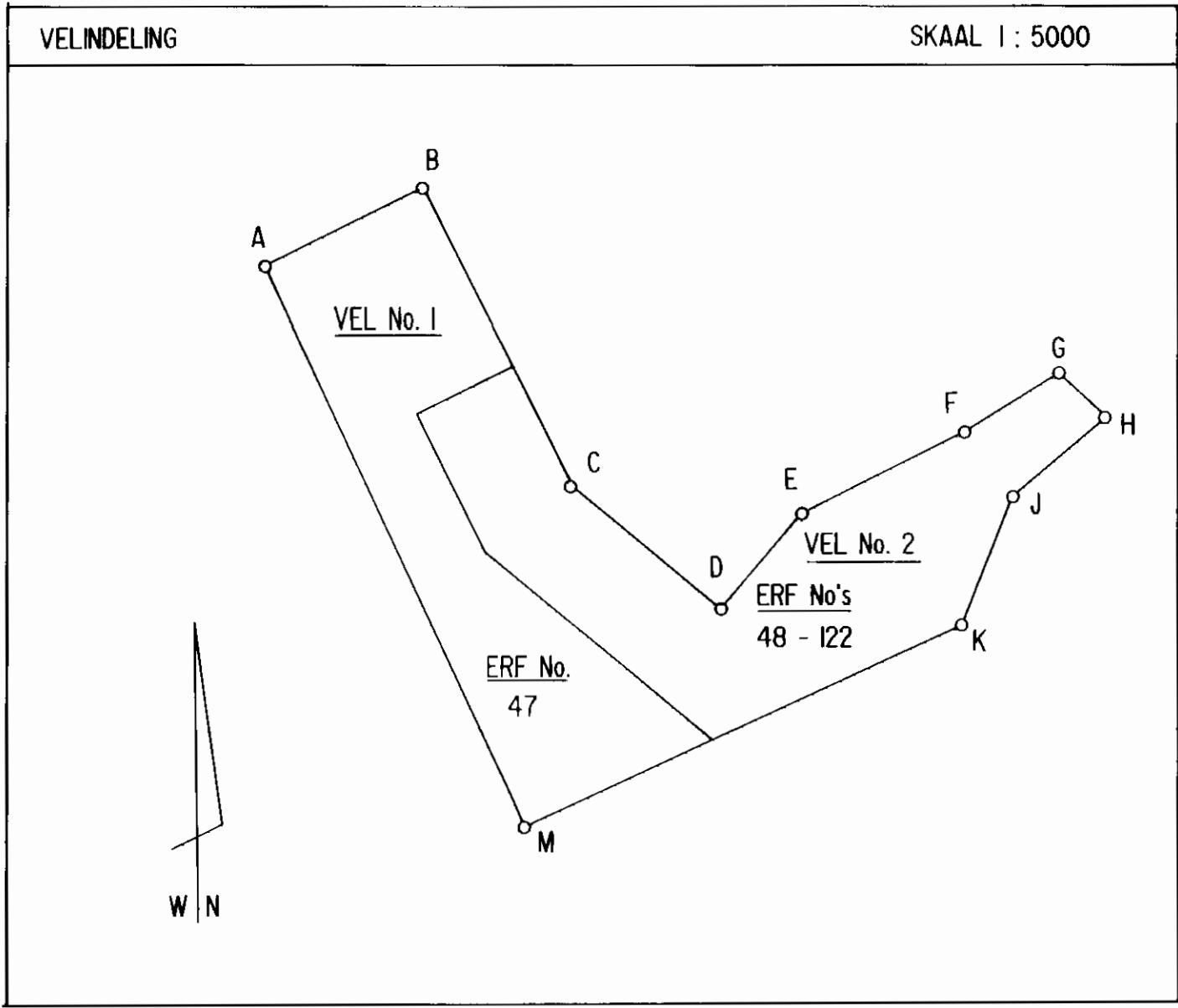
K Ysterpaal 100mm hoog

Alle ander bakens 12mm ysterpen

VERSEKERINGSMERKE

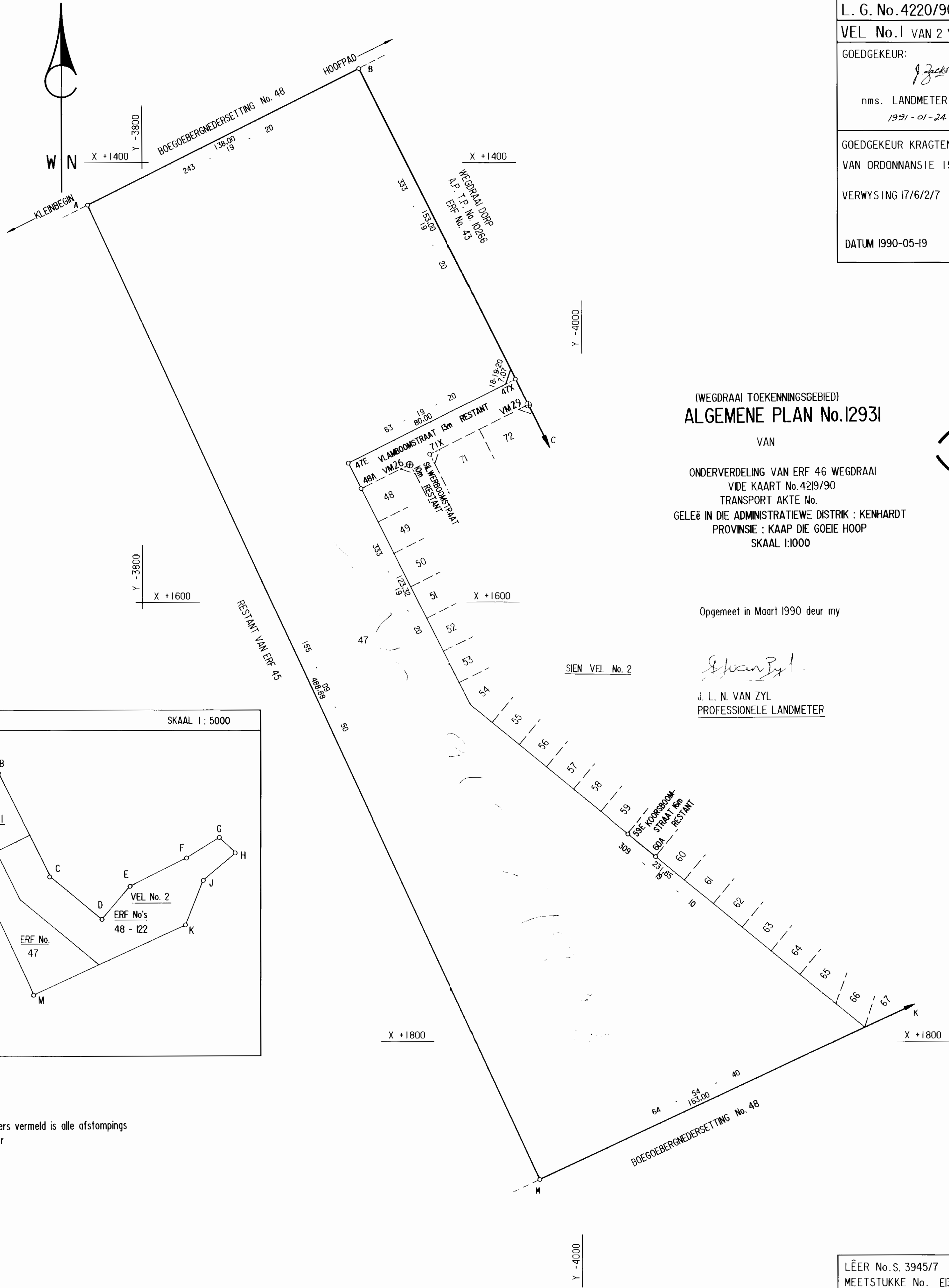
VM26, VM27, VM28, VM29, VM30 12mm ysterpen in beton 250mm ondergronds

GROOTTES	
ERF NOMMER	VIERTANTE METER
47	5,3056 heklaar
48	413
49	400
50	425
51	400
52	425
53	460
54	469
55	400
56	400
57	400
58	400
59	388
60	413
61	425
62	425
63	425
64	425
65	415
66	498
67	626
68	2,1997 heklaar
69	388
70	400
71	388
72	388
73	400
74	400
75	400
76	400
77	706
78	400
79	400
80	400
81	388
82	388
83	400
84	400
85	400
86	466
87	506
88	400
89	400
90	400
91	400
92	413
93	425
94	425
95	400
96	485
97	405
98	400
99	400
100	400
101	400
102	407
103	434
104	425
105	425
106	413
107	375
108	425
109	425
110	575
111	400
112	400
113	400
114	400
115	480
116	539
117	524
118	450
119	463
120	425
121	425
122	413



NOTA

Tensy anders vermeld is alle afstompings 5,00 meter



(WEGDRAAI TOEKENNINGSGBIED)
ALGEMENE PLAN No.12931

VAN

ONDERVERDELING VAN ERF 46 WEGDRAAI
VIDE KAART No.4219/90
TRANSPORT AKTE No.

GELEë IN DIE ADMINISTRATIEWE DISTRIK : KENHARDT
PROVINSIE : KAAP DIE GOEIE HOOP
SKAAL 1:1000

Opgemeet in Maart 1990 deur my

J. L. N. VAN ZYL

PROFESSIELE LANDMETER



L.G. KANTOORNOTAS

L. G. No.4220/90
VEL No.1 VAN 2 VELLE
GOEDGEKEUR:
rms. LANDMETER-GENERAAL.
1991 - 01 - 24
GOEDGEKEUR KRAGTENS ART. 25
VAN ORDONNANSIE 15/1985
VERWYSING 17/6/2/7
DATUM 1990-05-19

ENDOSSEMENTE				
NO.	WYSIGINGS	BYVOEGINGS	MAGTIGINGS	PARAAF

L.G. KANTOORNOTAS

LÊER No.s. 3945/7
MEETSTUKKE No. E1351/90
KOMPILASIE GK-8BCB (5633)

HIERDIE PLAN BESTAAN UIT 2 VELLE.

VEL NO. 1

L. G. No. F7656/80

Goedgekeur.

Landmeter-generaal.
1981-08-17

(TOEKENNINGSGEBIED WEGDRAAI)



TP
ALGEMENE PLAN No. 10266
van
DIE DORP WEGDRAAI

Bevattende 41 erwe genommer Erwe 2 - 42, 1 Openbare Plek *
genommer Erf 1 en die strate, geleë op Perseel 2316, gedeelte
van Perseel 1871, Boegoebergnederstelling, in die Administratiewe
Distrik Kenhardt, Provinsie Kaap die Goeie Hoop.
Sien kaart No. 7654/80, gehëg aan T/A 1985 28383

ERF 43 WEGDRAAI

SKAAL 1:1000

Opgemeet in Junie 1975,
deur my,

LANDMETER.

L. G. KANTOORNOTAS

Erf 29 Vidë kaart 11061/ 93
Erf 30 Vidë kaart 11062/ 93
Erf 33 Vidë kaart 11063/ 93
Erf 38 Vidë kaart 11064/ 93

KOÖRDINATE			STELSEL L° 21°			Konstante -80 000,00 Y -3 190 000,00 X			GROOTTES					
HOOFFIGUUR			VERSEKERINGSMERKE			BLOKHOEKE			ERF	VKTE.METER	ERF	VKTE.METER		
	Y	Meter X		Y	Meter X		Y	Meter X						
A	- 3 898,67	+ 1 357,34	VM 1	- 4 138,36	+ 1 666,24	1a	- 3 916,54	+ 1 348,37	2	3,1978	24	700		
B	- 4 105,97	+ 1 253,18	VM 2	- 4 099,68	+ 1 634,56	1d	- 4 559,75	+ 1 089,68	3	688	25	700		
C	- 4 276,25	+ 1 171,23	VM 3	- 4 087,31	+ 1 624,42	1k	- 4 194,15	+ 1 292,81	4	700	26	700		
D	- 4 578,97	+ 1 084,15	VM 4	- 4 021,60	+ 1 557,46	2e	- 4 594,00	+ 1 316,00	5	700	27	700		
E	- 4 605,24	+ 1 175,45	VM 5	- 4 015,76	+ 1 545,84	2f	- 4 484,00	+ 1 354,50	6	700	28	688		
F	- 4 608,66	+ 1 169,26	VM 6	- 3 993,31	+ 1 501,16	31c	- 4 148,59	+ 1 549,60	7	700	29	1,2950 ha.		
G	- 4 656,71	+ 1 155,44	VM 7	- 3 987,48	+ 1 489,55	32a	- 4 032,82	+ 1 579,79	8	700	30	1,0038 ha.		
H	- 4 662,90	+ 1 158,86	VM 8	- 3 956,05	+ 1 427,00	33c	- 4 158,82	+ 1 562,37	9	700	31	1612		
J	- 4 685,46	+ 1 237,32	VM 9	- 3 950,21	+ 1 415,38	33f	- 4 190,76	+ 1 602,28	10	700	32	3244		
K	- 4 712,61	+ 1 257,18	VM10	- 4 188,37	+ 1 310,26	35a	- 4 319,92	+ 1 485,28	11	700	33	8780		
L	- 4 713,70	+ 1 264,17	VM11	- 4 219,80	+ 1 372,81	35b	- 4 341,84	+ 1 471,30	12	700	34	2384		
M	- 4 684,17	+ 1 304,52	VM12	- 4 225,64	+ 1 384,43	37c	- 4 362,82	+ 1 504,18	13	700	35	338		
N	- 4 677,19	+ 1 305,61	VM13	- 4 248,09	+ 1 429,11	37d	- 4 340,90	+ 1 518,16	14	700	36	338		
O	- 4 691,71	+ 1 316,23	VM14	- 4 253,92	+ 1 440,72	38a	- 4 343,67	+ 1 463,01	15	688	37	338		
P	- 4 643,27	+ 1 382,46	VM15	- 4 276,37	+ 1 485,40	38f	- 4 370,57	+ 1 505,16	16	688	38	5825		
Q	- 4 518,76	+ 1 426,03	VM16	- 4 284,27	+ 1 499,34	39c	- 4 491,04	+ 1 368,99	17	700	39	7908		
R	- 4 327,07	+ 1 548,34	VM17	- 4 309,01	+ 1 542,86	39d	- 4 603,98	+ 1 329,46	18	700	40	2875		
S	- 4 199,07	+ 1 612,65	VM18	- 4 287,99	+ 1 479,56	39f	- 4 513,04	+ 1 414,26	19	700	41	5723		
T	- 4 135,75	+ 1 689,95	VM19	- 4 442,31	+ 1 400,08	40f	- 4 635,16	+ 1 371,52	20	700	42	2975		
U	- 4 016,86	+ 1 592,57	VM20	- 4 453,27	+ 1 393,09	41h	- 4 633,48	+ 1 273,63	21	700	44	1044		
Wegdraai A Opweg A			VM21	- 4 469,20	+ 1 442,23	OPENBARE PLEK			22	700	8 1,8056 ha.			
			VM22	- 4 480,16	+ 1 435,24				23	700				
			VM23	- 4 669,41	+ 1 324,70									
			VM24	- 4 629,06	+ 1 295,18									
			VM25	- 4 616,15	+ 1 285,73									

BAKENBESKRYWING

A. D-U. 12mm. ysterpen in beton.
B. C. Ysterpaal 100mm. hoog.
Alle ander 12mm. ysterpen.

VM 1 - VM 25 12mm. ysterpen in beton onder grond.

ADMINISTRATEUR SE GOEDKEURING AF. 52/1/26... GED. 1980-04-29

BEKENDGEMAAK AS 'N GOEDGEKEURDE DORP

KENNISGEWING NO. P.K. 560/1985 GED. 9-08-1985...

OFFIESIËLE KOERANT NO. 4385.....

ENDOSSEMENTE					
NO.	WYSIGING	BYVOEGING	MAGTIGING	GET.	DATUM
①	Openbare plek Erf 1 gesluit		kennissgewing d d 1998-09-07 Lêer 9/3945/11, p. 68 Toesiening bl. 68	PH	98-10-09
②	Grondreël van stukke geakut.	Erf 241 (L.G. 948/1998)	Kennissgewing d d 19-27 Lêer 9/3945/11 p. 54 Toesiening p. 51.	PH	6-6-2000

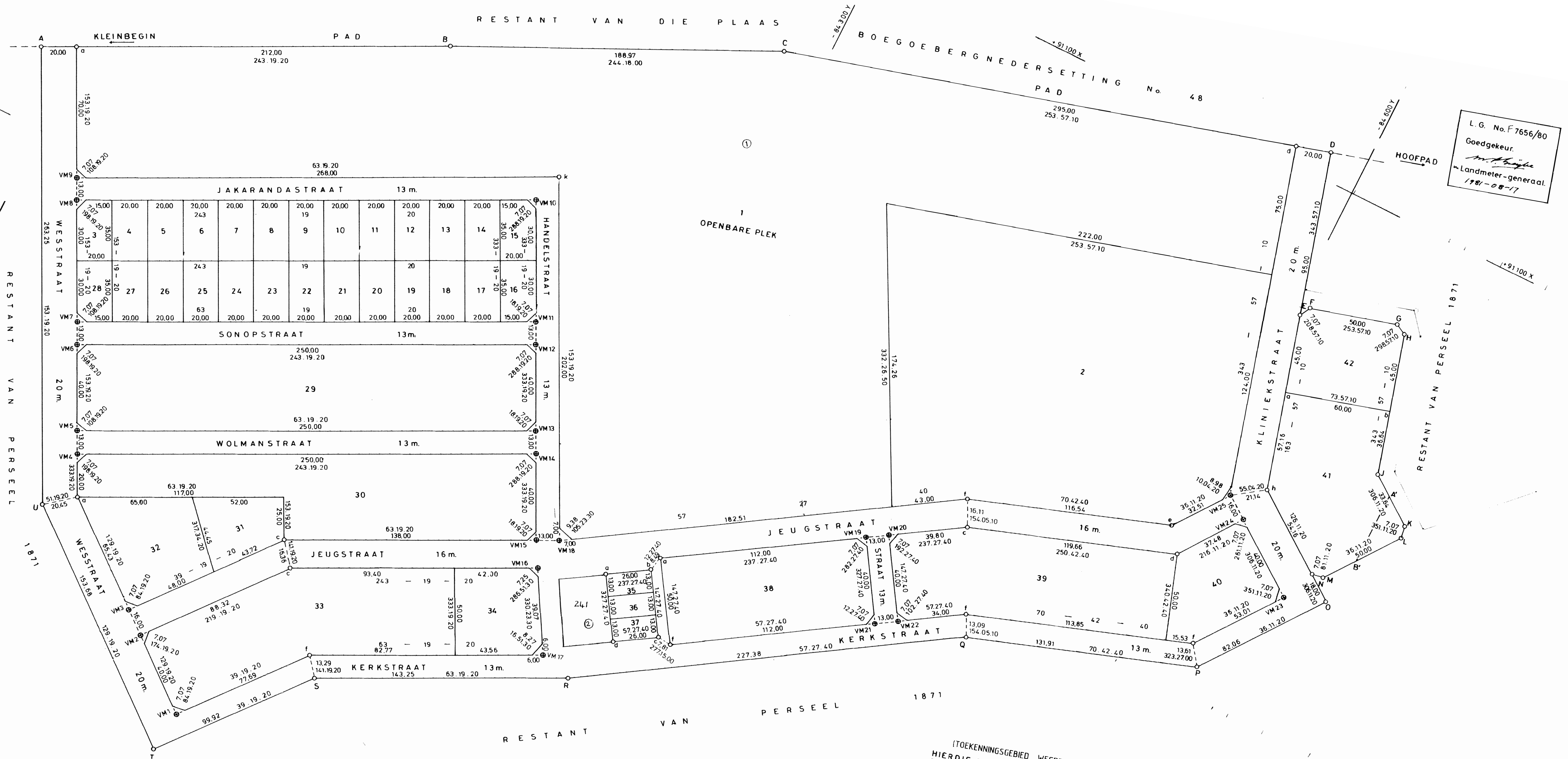
Oorspronklike krt. No. 7654/80

L-g. Lêer No. S. 3945/7/1

M.S. No. E.2482/80

Komp. GK - 8BCB (5633)

10266 (Sheet 2)



CDR

(TOEKENINGS-GEBIED WEGDRAAI)
HIERDIE PLAN BESTAAN UIT 2 VELLE.
VEL NO. 2
TP
ALGEMENE PLAN No. 10266
van
DIE DORP WEGDRAAI

Geleë in die Administratiewe Distrik Kenhardt,
Provinsie Kaap die Goeie Hoop.

Sien kaart No. 7654/80, geheg aan T/A 1985-28383
SKAAL 1:1000

Opgeneem in Junie 1975,
deur my,

[Signature]
LANDMETER.

NOTA:
Tensy anders vermeld is alle afstande
wat hoeke stompсны 5,00 meter.

Oorspronklike krt. No. 7654/80
L-g. Lëer No. S. 3945/7/1
M.S. No. E. 2482/80
Komp. GK-8BCB (5633)

7063/74

KANTOORAFSKRIF

SYE Meter	RIGTINGS -HOEKE	KOÖRDINATE			
		Y	Stelsel	L ^o 2 ^o	X
	Konstante	±	0,0	+3100 000,00	
AB	119,26	342,07,15	A	-85 114,95	+90 929,98
BC	193,76	342,07,15	B	-85 151,56	+91 043,48
CD	112,38	334,25,40	C	-85 211,05	+91 227,88
DE	113,26	59,00,00	D	-85 259,56	+91 329,25
EF	75,48	328,55,30	E	-85 162,48	+91 387,58
FG	911,48	74,07,08	F	-85 201,44	+91 452,23
GH	798,01	64,54,36	G	-84 324,75	+91 701,65
HJ	478,28	157,47,06	H	-83 602,04	+92 040,04
JK	766,35	243,19,17	J	-83 421,21	+91 597,26
KL	188,97	244,18,00	K	-84 105,97	+91 253,18
LA	872,71	253,57,08	L	-84 276,25	+91 171,23
NO	410,17	0,0,0	O	-84 696,79	+92 005,97
MP	4711,69	180,0,0	P	-84 696,79	+86 338,57
BQ	177,57	273,28,10	Q	-85 328,80	+91 054,23
	Opwag	Δ	-86 080,00	+93 242,92	
	Zaalskop	Δ	-85 523,41	+87 545,54	

Bakens.

A.B.C.D.E.F.G.H.J.K.L.Q.P.R. - Ysterpaal 100 mm hoog.
O.P. - Geen baken.

- (1) Figuur A.B.C.D.E.F.N.M. synde Perseel 1868 ged. van Perseel 1018
Boegoebergnederstelling. Volgens kaart 7064/74 geheg aan
T/A 1977. 16777 Perseel 1876
- (2) Figuur M.N.G.H.J.K.L. synde Ged. H. van die plaas Boegoeberg-
nederstelling No 48. Volgens kaart 7066/1974 geheg aan
T/A 1977. 16778

ERF 45 Wegdraai

Die figuur A.B.C.D.E.F.G.H.J.K.L.

stel voor

91,0788 Hektaar

grond, synde

Perseel 1871 Boegoebergnederstelling. en bevat (1)-(2)
hierbo

geleë in

Administratiewe Distrik

Kenhardt

Provinsie Kaap die Goeie Hoop.

Samgestel
Opgeëet in
Opgeëet
deur my, Junie 1974

J. van Zyl
Landmeter

Hierdie kaart is geheg aan

Die oorspronklike kaart is.

Lêer No. S/3945/7

No. S.V.T. 16779/77.
gedateer

No. 5005 hierbo beskryf
geheg aan

M.S. No. Saamgestel

t.g.v.

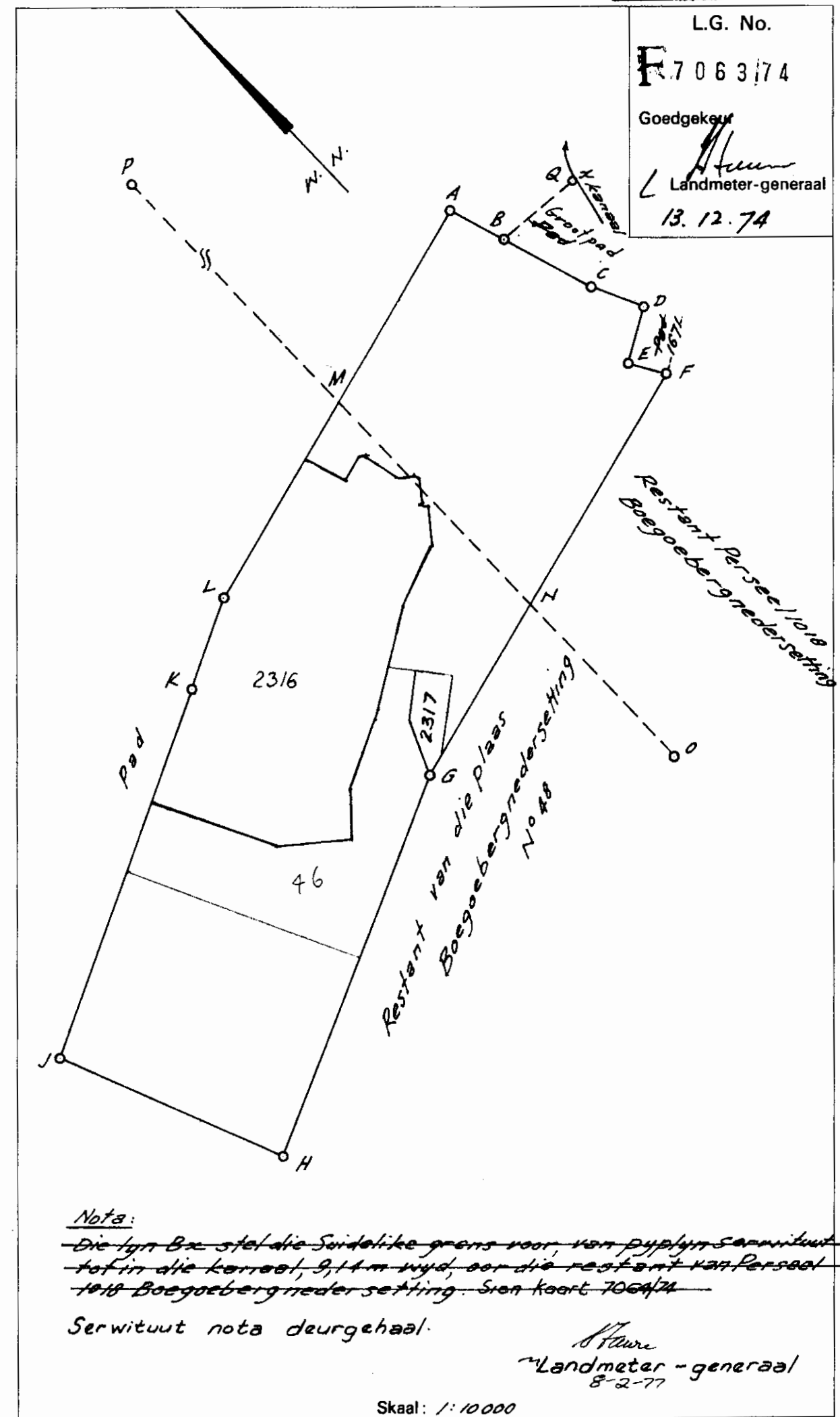
Transport/Grondbrief

Komp. Gk-8BCB (5693)

No.

Registrateur van Aktes

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ANNEXURE D: SERVICES REPORT



WEGDRAAI 360 HOUSING DEVELOPMENT

Engineering Services Investigation Report

Investigation of the available and required bulk civil and electrical services for the Wegdraai village development in the !Kheis municipal area

AUGUST 2020

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MACROPLAN

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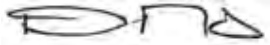
DOCUMENT CONTROL RECORD

Project Name:	Wegdraai 360 Stands – Engineering Services Investigation Report
Project Number:	34167 – WEGDRAAI
Report for:	MACROPLAN

REVISIONS:

Rev #	Date	Revision Details/Status	Prepared by / Author	Reviewed / Approved by
03	2020/08/25	Draft report to be circulated to relevant parties.	F.D. MARITZ	F.D. Maritz (Pr.Eng)

APPROVAL:

Author signature		Approver signature	
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EXECUTIVE SUMMARY

This report was compiled to investigate the bulk infrastructure serving the Wegdraai village and to determine whether the bulk infrastructure is adequate for the development of an additional 360 stands, through a low-cost housing development.

The bulk engineering services report includes the following categories:

- Bulk Water Infrastructure
- Bulk Sewer Infrastructure
- Bulk Road and Storm Water Infrastructure
- Bulk Electrical Infrastructure

After investigating the infrastructure, it was found that the existing bulk infrastructure is not sufficient to accommodate the Wegdraai 360 Houses project. The bulk services for each category that require attention before the project can commence is summarised below:

- **Bulk Water Infrastructure**

Upgrading of the entire bulk water supply system is required as these 360 houses will almost double the demand related to the existing 466 houses.

- **Bulk Sewer Infrastructure**

Construction of two new pump stations (6.6 l/s x 2).
Construction of two new 110mm rising mains (1.3km and 2.1km).
Construction of a new 0.5ML waste water treatment works;

- **Bulk Electrical Infrastructure**

Upgrading and extension of the existing bulk electrical supply system is required by Eskom, the extension of the electrical system will not be a problem as the main sub-station in Grobelaarshoop is currently being upgraded and will be commissioned in December 2020

This report can be used both for business plans and funding applications from the various funding schemes available.

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1. INTRODUCTION

1.1 Disclaimer

This is a draft report and only outlines some of the findings of the investigation to date and should not be used as the final or complete report. No recommendations or conclusions have been made and some portions of the report may be incomplete as the investigation is still in process.

1.2 Terms of Reference

- I. BVI Consulting Engineers was appointed by Macroplan to undertake this Bulk Engineering Services Study (Water, Sewer, Electricity and Roads & Storm Water) for the proposed Wegdraai 360 housing project. Wegdraai is one of six villages located close to the Orange river within the jurisdiction of !Kheis Local Municipality.

1.3 Site Location

- I. The site is situated approximately 40 km to the north-west of Groblershoop in the Northern Cape (Figure 1 – Locality Plan).
- II. The development is located at the following coordinates: 28°50'21.79" S; 21°51'51.86" E

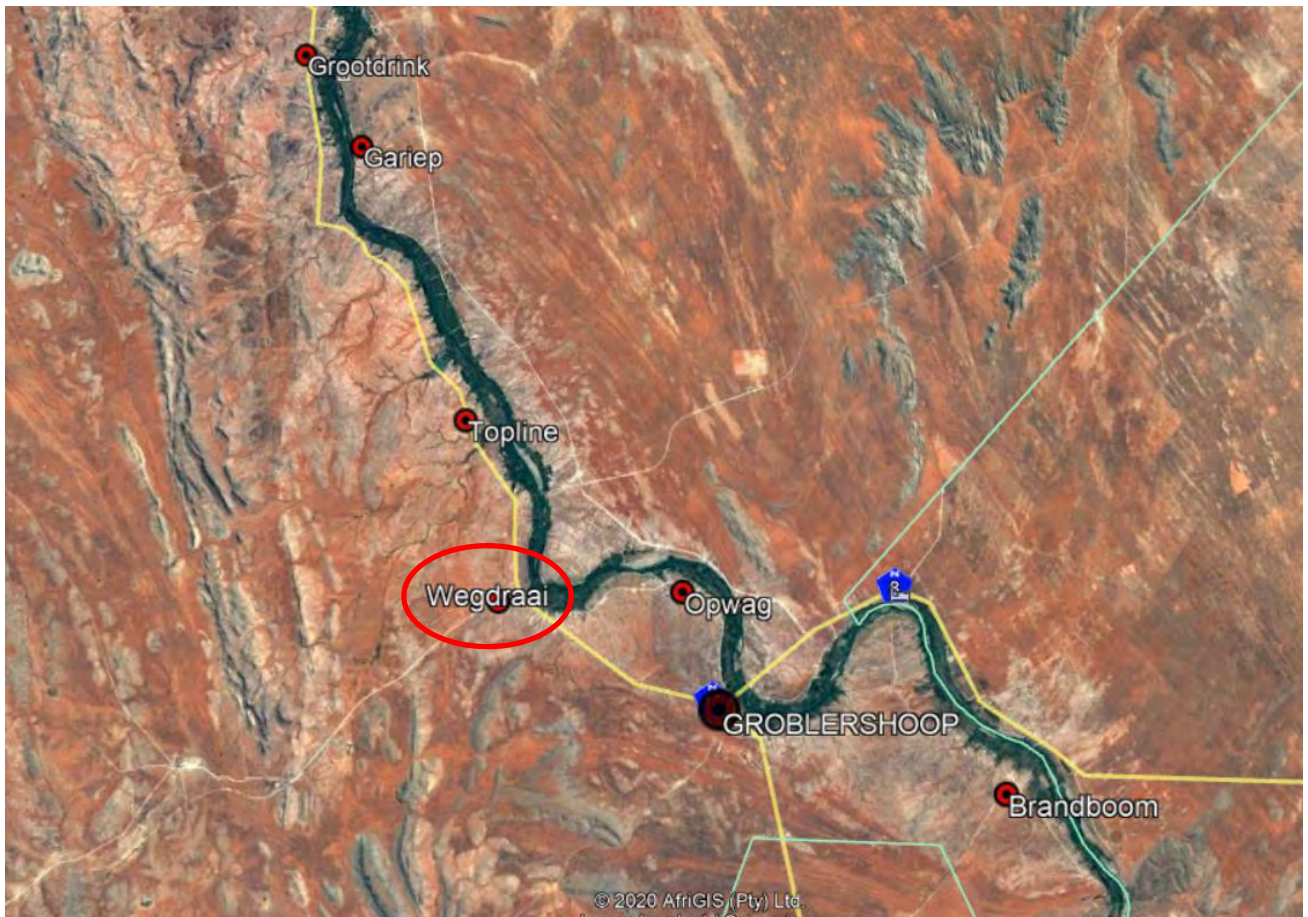


Figure 1: Wegdraai 360 Housing Development Locality Plan

- II. The planned development consists of 360 low-cost houses next to the existing village (Figure 2: 360 Stands Development Area)

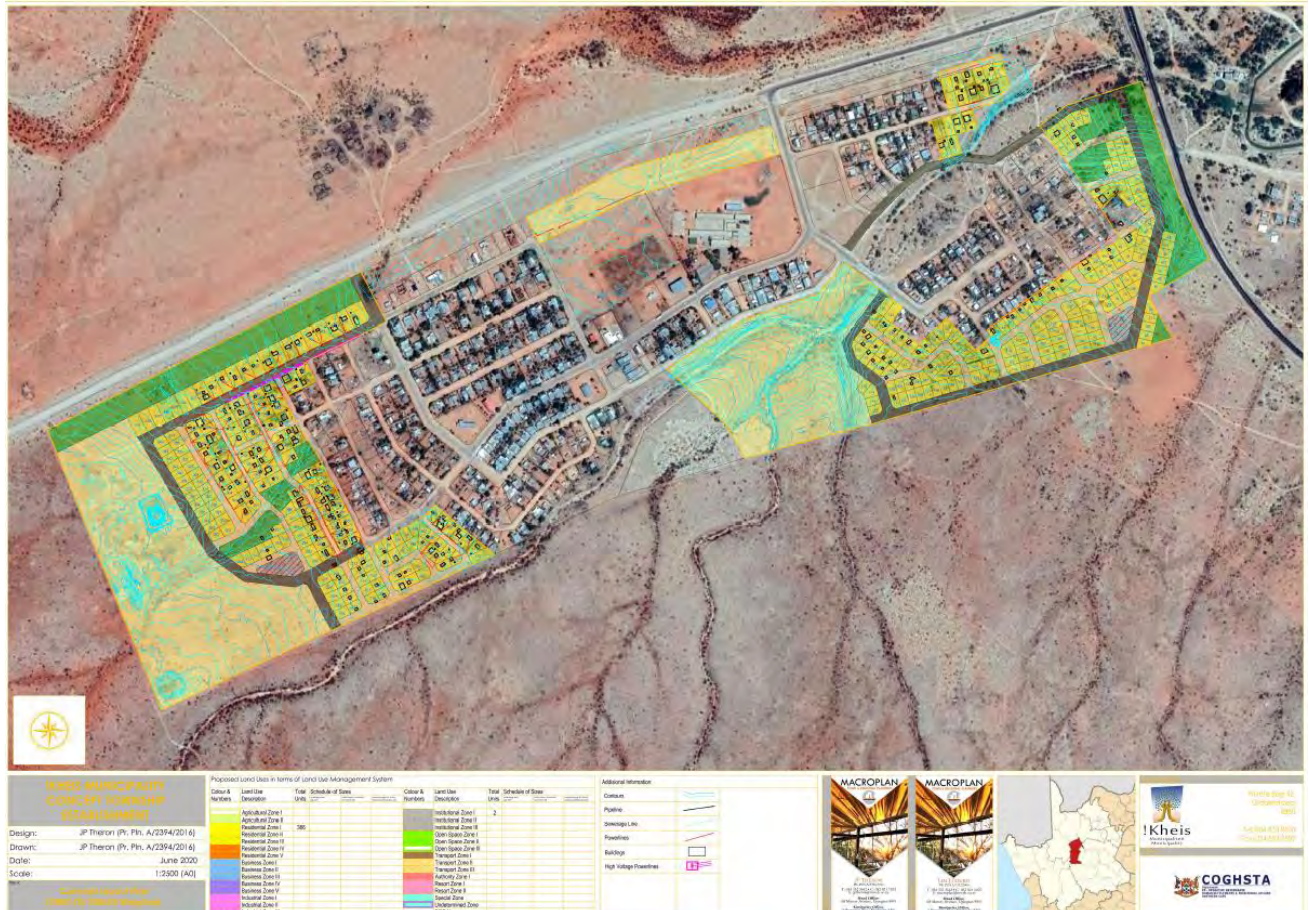


Figure 2: Wegdraai 360 Housing Development Development Area

- III. The purpose of the Bulk Engineering Services Assessment is to determine the availability and capacity of existing bulk services to service the proposed development. This report presents the findings of a preliminary visual inspection and desktop investigation relating to bulk services and further sets out the criteria and standards for the internal services for the new development.
- IV. The Bulk Engineering Services addressed in this report are the following:
- Water Supply
 - Sewerage
 - Roads and Access
 - Storm Water Management
 - Electricity Supply



2. TOPOGRAPHY

The physical characteristics of the site can be summarized as follows:

- Ground cover comprises mostly of natural veld with short grass;
- Topographically, the site has a relatively gentle sloping terrain from the the village towards the gravel roads.
- Calcrete is close to the surface of the natural ground level, which makes excavations very hard.

3. WATER SUPPLY

3.1 Existing Water Infrastructure

Overview

The bulk water infrastructure supplying Wegdraai village with water can be summarised as follows:

- A raw water river pump station delivering **6.5l/s**;
- A 1 200m long, 110mm diameter PVC **Class 6** raw water supply line between the river and the water purification works on the side of the village
- The water treatment works consisting of:
 - An open raw water storage dam
 - A UPMC water treatment system
 - A Sectional steel storage tank
 - A high lift pump station
 - A Elevated Sectional steel storage tank (pressure towers)
- Distribution into the village



Figure 2: Existing Bulk Water Infrastructure

Raw Water Supply

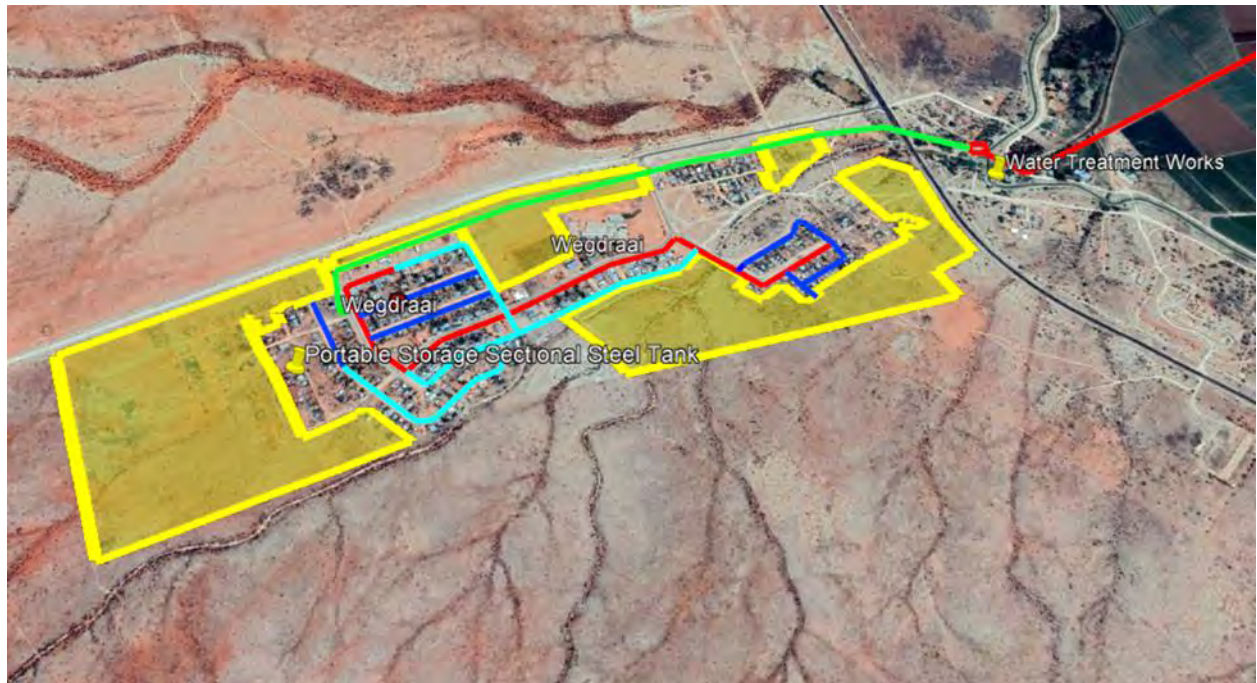
Water supplied to Wegdraai is extracted from Orange River by means of a pump station fitted on a stand with a pole mounted switchgear. The pump station consists of one pump that delivers 12l/s to the raw water treatment works.

Raw water is pumped from the rivier pump station to the purification plant, delivering a maximum flow rate of 12 l/s through a 1 000m long, 110mm diameter Class 6 PVC pipeline to a 100 m³ raw water storage dam next to the Water Treatment Works in the village



Water treatment and storage site

The figure below shows the site layout where the treatment works and potable water storage reservoirs, is located.



Water is pumped from the raw water storage dam through the Water Treatment Plant with a capacity of 14l/s to a 380m³ sectional steel potable water storage reservoir. From there, it is pumped into the 134m³ elevated storage tank before is gravitates into the village network.

The photo's below shows the reservoirs and treatment plant.



Water Treatment Plant

The Water Treatment Works (WTW) consist of a dosing system as well as 50 000l/h UFMC water treatment system as shown on the photos below.

Photo's below shows the water treatment system and also the pumps and MCC panels of the Water Treatment Plant:



Pressure Towers

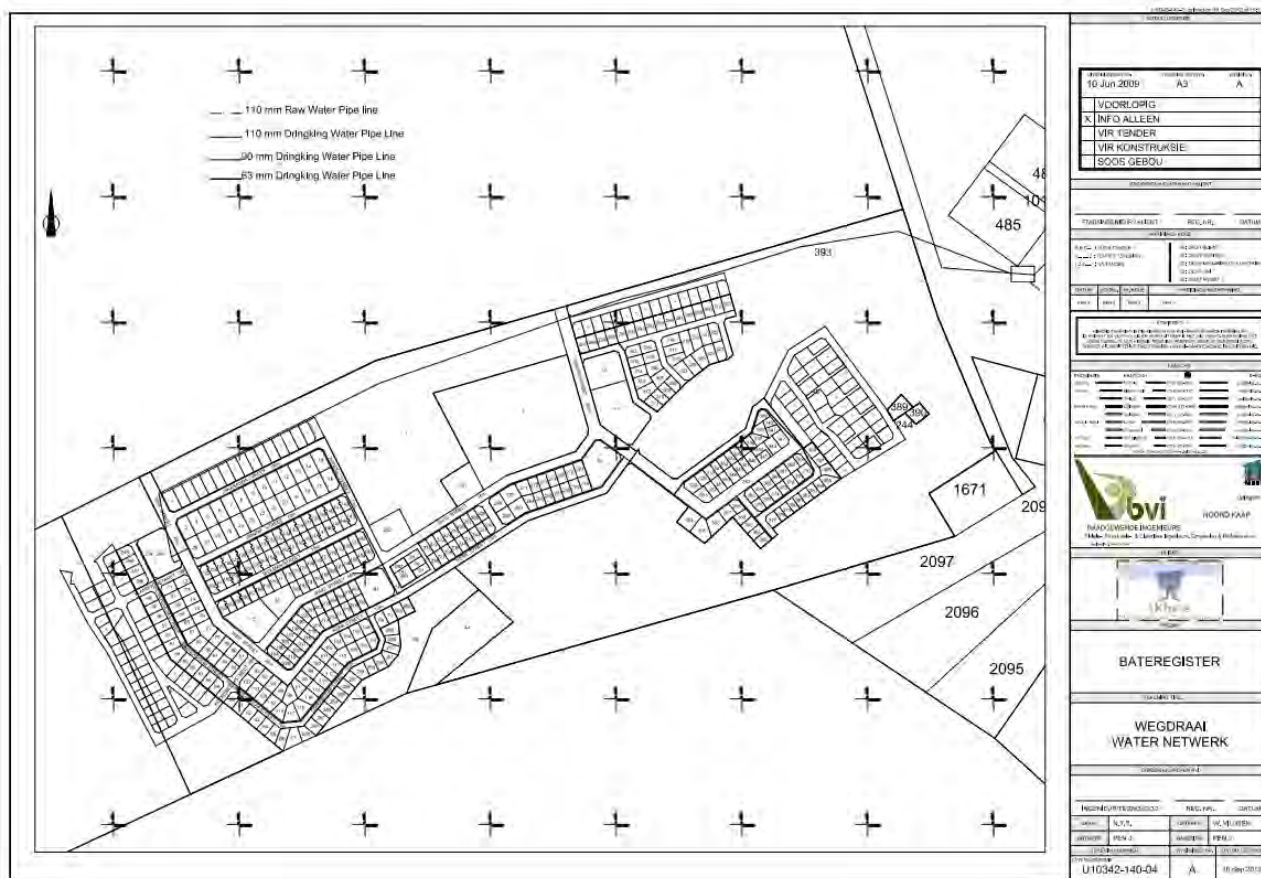
The potable water is delivered from the elevated storage tank into the reticulation network via a 110mm diameter PVC pipeline.



Reticulation System

The potable water is delivered from the elevated storage tank into the existing reticulation network.

The reticulation network is shown in the drawing below.



Condition of the water supply system

Most of the elements of the water supply system are currently manually operated. These include the river pump, the water treatment works, and the reservoir levels. Water is distributed to the village from the sectional steel reservoir that stores potable water. Most of the water meters and pressure gauges are out of service. Please refer to the photo's below for more information.



3.2 Current water demands and capacity of the existing bulk water supply system

The Red Book was used as basis for calculations of the theoretical capacity for the current bulk water supply system as well as required infrastructure.

The table below shows factors capacities and operating hours used in the calculations:

OPERATING HOURS	1	Source Pump Station (SPSH)	(Maximum operating hours per day that required volume of water	16 hours
	2	Water purification plant (WTPH)	(Maximum operating hours per day that required volume of water	16 Hours
	3	Lifting Pump Station (LPS%)	(% of Instantaneous peak flow)	150%
STORAGE	1	Storage in elevated tanks	(Hours of Instantaneous Peak Demand)	4 hours
	2	Potable Water Storage Reservoirs	(Hours of Annual Average Daily Demand*SPF)	48 hours
	3	Raw Water Storage Reservoirs	(Hours of Summer Average Daily Demand)	1 days

The table on the next page shows the current theoretical demands and capacity of the existing bulk water infrastructure:

BULK AND CONNECTOR SERVICES CAPACITY CALCULATION : CURRENT									
GENERAL	NO.	DESCRIPTION	UNITS		DEMAND PER UNIT		Criteria		
	1	Sub-Economical Houses (Existing)	466	Houses x	600	l/ household per day	279.6	m ³ /d	
	2	Sub-Economical Houses (360 houses development)	0	Houses x	600	l/ household per day	0	m ³ /d	
	4	Economical Houses (Existing)	0	Houses x	1200	l/ household per day	0	m ³ /d	
	5	Economical Houses (360 houses development)	0	Houses x	1200	l/ household per day	0	m ³ /d	
	7	Primary School Hostel	0	Learners	150	l/ Learner per day	0	m ³ /d	
	8	Schools	200	Learners	25	l/ Learner per day	5	m ³ /d	
	9	High School Hostel	0	Learners	150	l/ Learner per day	0	m ³ /d	
	10	High School	250	Learners	25	l/ Learner per day	6.25	m ³ /d	
	11	Clinics	250	m ² x	500	l/100m ² per day	1.25	m ³ /d	
	12	Businesses, Government and Municipal	500	m ² x	400	l/100m ² per day	2	m ³ /d	
	13	Developed Parks, Sportsgrounds and Day Cares	0.50	ha	5	mm water per day	25	m ³ /d	
	ANNUAL AVERAGE DAILY DEMAND (AADD)								319.1 m ³ /d
FACTORS	1	Design Loss Factor Water treatment works (LFW)							10.0%
	2	Design Loss Factor Total conveyance losses (LFr)							15.0%
	3	Summer peak factor (SPF)							1.5
	4	Peak factor reticulation (PFR) From Red Book (Instantaneous Peak)							6
THEORETICAL DEMANDS	1	Annual Average Daily Demand (AADD)	AADD	319.1 m ³ /day	13.3 m ³ /hour	3.7 l/s	CURRENT CAPACITY		
	2	Gross Annual Average Daily demand (GAADD)	(1+Lfr)*AADD	367.0 m ³ /day	15.3 m ³ /hour	4.2 l/s			
	3	Summer Gross Daily Demand (SGDD)	SPF*GAADD	550.4 m ³ /day	22.9 m ³ /hour	6.4 l/s			
	4	Instantaneous Peak Demand (IPD) (Main supply pipeline to reticulation)	AADD*PFR		79.8 m ³ /hour	22.2 l/s			
	5	Storage Capacity Elevated Storage	hours*IPD			319.1 m ³	135.0 m ³	42%	
	6	Lifting Pump Station Capacity and Pipeline Flow between Main Storage and Elevated tank	IPD*LPS%	206 mm dia	119.7 m ³ /hour	33.2 l/s	12.0 l/s	36%	
	7	Potable Water Storage Capacity (Main Storage)	hours*AADD			380.0 m ³	256.0 m ³	67%	
	8	Water Treatment Plant Capacity (WTPC)	SGDD*24/WTPH	825.7 m ³ /day	34.4 m ³ /hour	9.6 l/s	14.0 l/s	146%	
	9	Source Pump Station Capacity and Pipeline Flow	WTPC*(1+LFW)*24/SPS	145 mm dia	59.3 m ³ /hour	16.5 l/s	12.0 l/s	73%	
	10	Raw Water Storage Capacity	Days*SGDD			550.0 m ³	100.0 m ³	18%	

It is clear from the table that the existing infrastructure is already under pressure to handle the demand.

3.3 Bulk Water Infrastructure Requirements

The table below compares the current infrastructure capacities with the capacity that is required for the 360 stands development.

BULK AND CONNECTOR SERVICES CAPACITY CALCULATION : FUTURE									
GENERAL	NO.	DESCRIPTION	UNITS		DEMAND PER UNIT		Criteria		
	1	Sub-Economical Houses (Existing)	466	Houses x	600	l/ household per day	279.6	m ³ /d	
	2	Sub-Economical Houses (360 houses development)	360	Houses x	600	l/ household per day	216	m ³ /d	
	4	Economical Houses (Existing)	0	Houses x	1200	l/ household per day	0	m ³ /d	
	5	Economical Houses (360 houses development)	0	Houses x	1200	l/ household per day	0	m ³ /d	
	7	Primary School Hostel	0	Learners	150	l/ Learner per day	0	m ³ /d	
	8	Schools	200	Learners	25	l/ Learner per day	5	m ³ /d	
	9	High School Hostel	0	Learners	150	l/ Learner per day	0	m ³ /d	
	10	High School	250	Learners	25	l/ Learner per day	6.25	m ³ /d	
	11	Clinics	250	m ² x	500	l/100m ² per day	1.25	m ³ /d	
	12	Businesses, Government and Municipal	500	m ² x	400	l/100m ² per day	2	m ³ /d	
	13	Developed Parks, Sportsgrounds and Day Cares	0.50	ha	5	mm water per day	25	m ³ /d	
	ANNUAL AVERAGE DAILY DEMAND (AADD)								535.1 m ³ /d
THEORETICAL DEMANDS	1	Annual Average Daily Demand (AADD)	AADD	535.1 m ³ /day	22.3	m ³ /hour	6.2	l/s	CURRENT CAPACITY
	2	Gross Annual Average Daily demand (GAADD)	(1+Lfr)*AADD	615.4 m ³ /day	25.6	m ³ /hour	7.1	l/s	
	3	Summer Gross Daily Demand (SGDD)	SPF*GAADD	923.0 m ³ /day	38.5	m ³ /hour	10.7	l/s	
	4	Instantaneous Peak Demand (IPD) (Main supply pipeline to reticulation)	AADD*PFR		111.5	m ³ /hour	31.0	l/s	
	5	Storage Capacity Elevated Storage	hours*IPD				445.9 m ³	135.0 m ³	30%
	6	Lifting Pump Station Capacity and Pipeline Flow between Main Storage and Elevated tank	IPD*LPS%	243 mm dia	167.2	m ³ /hour	46.4	l/s	26%
	7	Potable Water Storage Capacity (Main Storage)	hours*AADD				1070.2 m ³	256.0 m ³	24%
	8	Water Treatment Plant Capacity (WTPC)	SGDD*24/WTPH	1384.6 m ³ /day	57.7	m ³ /hour	16.0	l/s	87%
	9	Source Pump Station Capacity and Pipeline Flow	WTPC*(1+LFW)*24/SPS	188 mm dia	99.5	m ³ /hour	27.6	l/s	43%
	10	Raw Water Storage Capacity	Days*SGDD				923.0 m ³	100.0 m ³	11%

Recommended upgrades to the Wegdraai bulk water infrastructure are as follows :

- Construction of a new 28l/s river pump station with a duty and standby pump.
- New 1000m long 200mm diameter uPVC pipeline between the river pump station and the existing potable water storage reservoir.
- Upgraded Water Treatment Works capable of delivering 24m³/h on the existing treatment works site
- An additional 700m³ sectional steel reservoir next to the upgraded water treatment works
- A new 650m³ sectional steel pressure tower on the highest point to the south.
- A new 46l/s uplifting pump station at the treatment works.
- A new 2200m long 250mm pipeline between the lifting pump station and the new pressure tower.





Fire Fighting Requirements

Areas to be protected by a fire service should be classified according to a fire-risk category. The new development can be classified as a “Low risk – Group 4” according to the “Guidelines for Human Settlement Planning and Design”.

No specific provision for fire fighting water is required in water storage, or reticulation mains in these areas. Hydrants should, however, be located at convenient points in the area on all mains of 75 mm nominal internal diameter and larger, and in the vicinity of all schools, commercial areas and public buildings.

Fire fighting in areas zoned “Low-risk – Group 4” should generally be carried out using trailer-mounted water tanks or fire appliances that carry water, which can be replenished from the hydrants provided in the reticulation, if necessary.

4. SEWERAGE

4.1 Existing Sewage Infrastructure overview

Houses in the Wegdraai village is currently serviced by conservancy tanks and VIP toilets. There are currently no waterborne sewer system in place. The conservancy tanks are currently emptied by the honey suckers at the existing oxidation pond system. The photos below refers to the existing oxidation pond system.



Condition of the Oxidation Ponds System

The condition of the existing oxidation ponds is not functional. The concrete inlet and works and primary dams needs attention. Portions of the HDPE lining of the secondary ponds were removed and needed to be replaced or repaired.

4.2 Bulk Sewer Infrastructure Requirements

If a full borne sewer sewerage system is required for the new 360 houses development, the associated bulk infrastructure will consist of a pumpstation, rising main pipeline and upgraded oxidation ponds as shown on the Google image below.





The total sewer flow is calculated as follows:

WEGDRAAI TOTAL SEWER FLOW						
Sewer flow per day - Sub economical houses	907	sub economical houses @	500 l/day	453 500	l/day	
Sewer flow per day - Economical houses	0	economical houses @	750 l/day	-	l/day	
Sewer flow per day - Hostels	0	persons @	140 l/day	-	l/day	
Sewer flow per day - Schools	400	persons @	20 l/day	8 000	l/day	
Businesses and State Institutions	0	buildings	100 l/day	-	l/day	
SEWER FLOW PER DAY - TOTAL				461 500	l/day	



The sizes and capacities of the proposed pump station and rising main were calculated as follows:

PUMP STATION No 1 AND RISING MAIN					
Sewer flow per day - Sub economical houses	907	sub economical houses @	500 l/day	453500	l/day
Sewer flow per day - Economical houses		economical houses @	750 l/day	0	l/day
Sewer flow per day - Hostels	0	persons @	140 l/day	0	l/day
Sewer flow per day - Schools	400	persons @	20 l/day	8000	l/day
Businesses and State Institutions	0	buildings	100 l/day	0	l/day
SEWER FLOW PER DAY - TOTAL				461500 l/day	
Average sewer flow				5.3	l/s
Factor for inflow from other sources	30%			1.6	l/s
Sewer flow with inflow from other sources				6.9	l/s
PEAK NETWORK SEWER FLOW	2.0		3.5	24.3	l/s
FLOWRATE FROM OTHER PUMP STATIONS				0	l/s
TOTAL PEAK FLOW				24.30 l/s	
ACTUAL PUMP ABILITY	1.63	times peak flow		39.6	l/s
Theoretical pump station capacity for normal pump operation	1	hours of peak flow		87	m ³
Theoretical pump station capacity for emergency storage	4	hours of normal flow		100	m ³
TOTAL REQUIRED THEORETICAL PUMP STATION CAPACITY				187 m³	
Pump details					kW
Rising main diameter				268	mm
Rising main material				PVC	
Rising main length				940	m
Static pump height				10	m
Friction losses				4	m
Total pump height				14	m

Recommended Wegdraai bulk sewer infrastructure construction (excluding internal sewer lines) are as follows (shown on the drawing above):

- Construction of two new sewer pump stations capable of delivering 40 l/s direct to the Waste Water Treatment plant.
- New 940m long, 250mm diameter Class 6 PVC pipelines between the pump station and a new Waste Water Treatment Plant (oxidation ponds).
- Upgrading of the existing Waste Water Treatment Plant (oxidation ponds) with a capacity of 0.5MI per day.

5. SOLID WASTE

NO PHOTOS OR INFORMATION AVAILABLE AT THIS STAGE.

6. ROADS AND STORMWATER

6.1 Roads and Access

Access to the development will be from the existing Residential Collector Streets (Class 4b), as shown on the drawing below:

No problems are foreseen regarding roads and access.

6.2 Stormwater Management

The guiding principle underlying the storm water management strategy is that, where possible, the peak run-off from the post-developed site should not exceed that of the pre-developed site for the full range of storm return periods (1:2 to 1:50). Where possible, measures should be incorporated into the site development plan to attenuate the post-development flows to pre-development rates.

The storm water network must be designed to accommodate (flood frequencies as prescribed by “The Red Book”) the minor storm event (1:5 year) in open channels or side drains of streets. The major storm (1:50 year) should be managed through controlled overland flows, above-ground attenuation storage (if required) and berms at the higher end of the site (if required). As no formal storm water system exists in the area, concentration of storm water must be avoided as far as possible. Earthworks on plots should therefore encourage free drainage of the area.

Wegdraai is a small village that generally drains from the centre. Existing roads will be adequate for this purpose.

7. ELECTRICAL SUPPLY

7.1 Electrical Demands and Availability

This section of the report covers the availability of the Bulk Electrical connection to the future 360 Community stands, an expected additional load of the proposed development will initially be 432 KVA as per INEP guidelines and the accommodation of this load will form the basis of this report. The community of Wegdraai falls directly under “Eskom Distribution” and the existing electrified homes in the community purchase electricity directly from Eskom and not through the Kheis local Municipality.

The bulk connection to the community / town is via a 22kV overhead line fed from the 10MVA Grobelershoop sub-station



7.2 Existing Electrical Network

The bulk connection to the community / town is via a 22kV overhead line fed from the Eskom 10MVA Grobelershoop sub-station, this sub-station is currently in the process of being upgraded to 20MVA and will be commissioned in December 2020.

The existing MV electrical network in the Wegdraai area runs through the town via 22 KV overhead line feeder connecting to various pole mounted transformers (see below). The existing overhead line feed is running through a section of the proposed development and 35 informal homes have been electrified by Eskom.

The existing feeder can easily handle the future additional 432 kVA load only after the upgraded Eskom Groblershoop sub-station is brought online as indicated by Eskom’s network planning department.



Wegdraai 360 Erven – DRAFT Engineering Services Investigation Report || Rev No. 03 | 2020/08/25

8. COST ESTIMATE

The cost estimate for the proposed activities are as provided below. The level of accuracy is commensurate with a concept level design.

Description	Amount
Water Bulk Services	
New mobile 12l/s river pump station	R 850 000,00
0,85km 125mm Ø supply line	R 722 500,00
Upgrading of Water Treatment Works	R 700 000,00
New 360m ³ storage reservoir	R 900 000,00
New 240m ³ storage reservoir	R 840 000,00
New 24l/s lifting pump station	R 240 000,00
0,3km 200mm Ø line from lifting PS to elevated storage	R 285 000,00
Sub-Total (Water)	R 4 537 500,00
Bulk Sewer Services	R -
New 0,25 ML oxidation pond system	R 2 675 662,36
New sewer pump station No 1	R 1 676 508,10
New sewer pump station No 2	R 1 676 508,10
2,1km 110mm Ø uPVC rising main (PS No.1)	R 2 233 596,40
1,3km 110mm Ø uPVC rising main (PS No.2)	R 1 451 837,66
Sub-Total (Sewer)	R 8 262 274,95
Roads and Access	R -
None	R -
Stormwater	R -
None	R -
Electrical	R -
O/H ACSR line ring	R 2 300 000,00
Circuit breaker (11kV, LC1&2)	R 1 550 000,00
O/H ACSR line to POC	R 1 850 000,00
Sub-Total (Electrical)	R 5 700 000,00
Sub-Total	R 18 499 774,95
15% P&G's	R 2 774 966,24
Sub-Total	R 21 274 741,19
10% Contingencies	R 2 127 474,12
Sub-Total	R 23 402 215,31
10% Professional fees	R 2 340 221,53
Sub-Total	R 25 742 436,84
15% VAT	R 3 861 365,53
Grand Total	R 29 603 802,37



Notes:

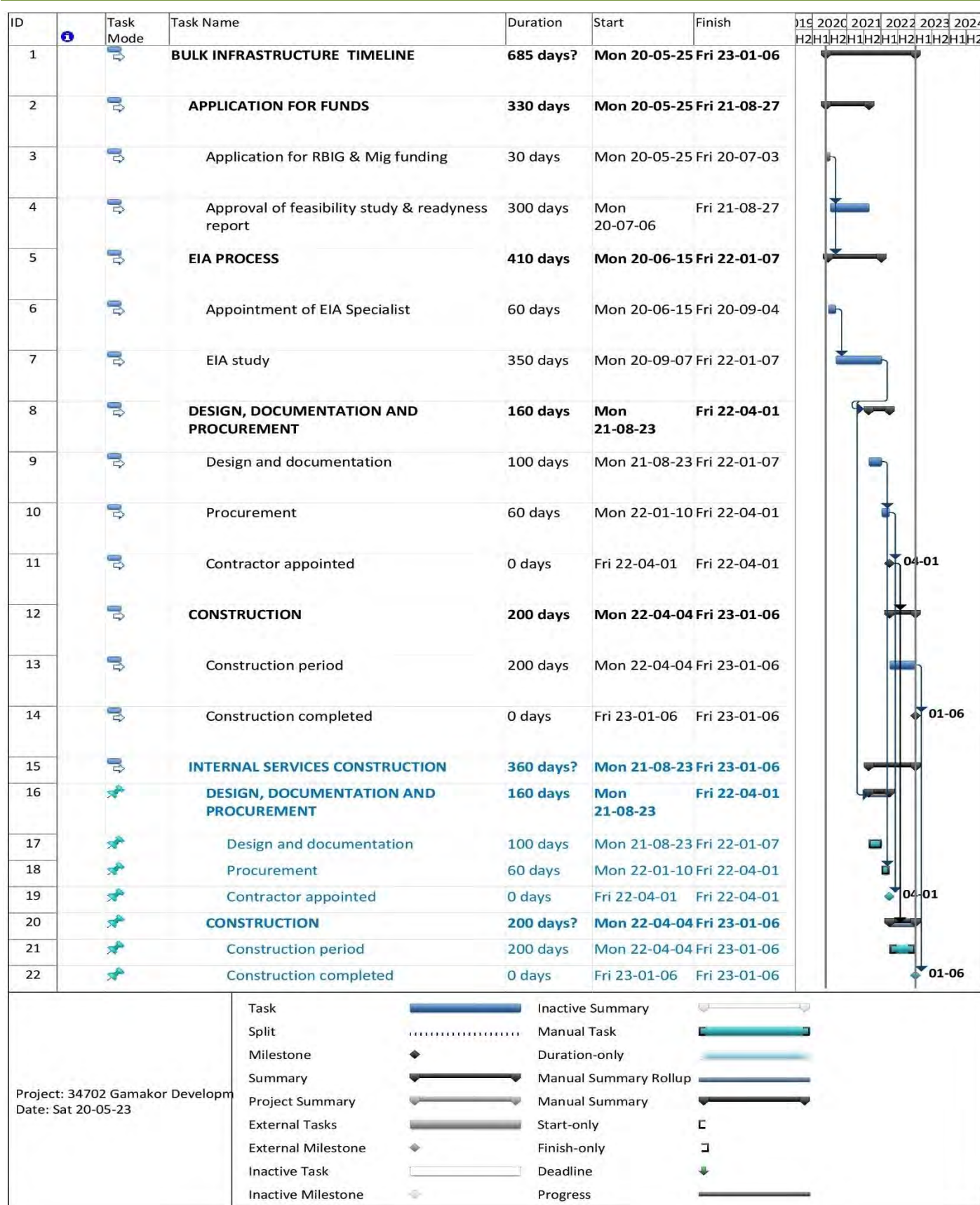
- 1) Base date of the calculations is April 2020;
- 2) No provision was made for EIA, registration and/or land acquisition;
- 3) No allowance was made for institutional and/or social development.

7.1 Funding

Funding can be applied for through the Municipal Infrastructure Grant (MIG) and Regional Bulk Infrastructure Grant (RBIG). For repair work at the water treatment works, the Water and Sanitation Infrastructure Grant (WSIG) can also be applied for.

This report can be used for funding application from the various schemes available.

9. PROJECT TIMELINE



10. CONCLUSION

Engineering services were assessed to determine spare capacity on the existing bulk infrastructure and compared to the estimated demand of the newly proposed Wegdraai 360 houses development.

The findings and conclusions in this report are based on a preliminary desktop study, as well as site visits.

- **Bulk Water Infrastructure** – The current capacity of the bulk water infrastructure is not enough to accommodate the proposed 360 houses development as is. It is proposed that the infrastructure should be upgraded, not only to provide adequate capacity for the Gamakor development, but also for future water demand increases. The following upgrades are proposed:
 - Construction of a new 12l/s mobile river pump station with a duty and standby pump.
 - New 125mm diameter Class 6 PVC pipeline between the river pump station and the existing potable water storage reservoir.
 - Upgraded Water Treatment Works capable of delivering 24m³/h on the existing treatment works site
 - A new 360m³ sectional steel reservoir next to the upgraded water treatment works
 - A new 250m³ sectional steel pressure tower on the highest point to the north.
 - A new 24l/s uplifting pump station at the treatment works.
 - A new 200mm pipeline between the lifting pump station and the pressure tower.
- **Bulk Sewage Infrastructure** – There is currently no bulk sewer infrastructure. Recommended Wegdraai bulk sewer infrastructure construction (excluding internal sewer lines) are as follows (shown on the drawing above):
 - Construction of two new sewer pump stations capable of delivering 6.7 l/s direct to the Waste Water Treatment plant.
 - New 110mm diameter Class 6 PVC pipelines (2100m & 1300m) between the pump stations and a new Waste Water Treatment Plant (oxidation ponds).
 - Construction of a Waste Water Treatment Plant (oxidation ponds) with a capacity of 0.5MI per day.
- **Roads and Access:** No bulk infrastructure upgrading required on the roads.
- **Storm Water Management:** No bulk infrastructure upgrading required on the storm water.
- **Electricity Supply** – Formal bulk upgrade process to be finalised between Eskom and !Kheis Municipality.
- **Electrical Load Centre** – The existing Load Centre “Keimoes Nommer 2” can accommodate the future additional load, with only minor modification to be done in the Load Centre and as agreed with the Municipality’s Electrical Department.



In conclusion, the engineering services are not in place (water and sewer) to meet the standard requirements. The infrastructure will have to be upgraded regardless of the implementation of the Wegdraai 360 houses development in order to meet current and expected future needs. The upgrading should be done in such a way as to take into consideration the Wegdraai 360 Houses development.

ANNEXURE E: DETAIL LAYOUT





IKHEIS MUNICIPALITY CONCEPT TOWNSHIP ESTABLISHMENT

Design: JP Theron (Pr. Pln. A/2394/2016)
Drawn: JP Theron (Pr. Pln. A/2394/2016)
Date: October 2020
Scale: 1:2500 (A1)

Concept Layout Plan
(DWG.TE) 200825 Wegdraai

Proposed Land Uses in terms of Land Use Management System

Colour & Numbers	Land Use Description	Total Units	Schedule of Sizes	Colour & Numbers	Land Use Description	Total Units	Schedule of Sizes
	Open Space Zone I				Undermined Zone	7	
	Open Space Zone II	6			Business Zone I	3	
	Open Space Zone III				Business Zone II		
	Agricultural Zone I				Business Zone III		
	Agricultural Zone II				Business Zone IV		
	Resort Zone II				Business Zone V		
	Residential Zone I	364	384.6m² 14ha		Business Zone VI		
	Residential Zone II				Industrial Zone I		
	Residential Zone III				Industrial Zone II		
	Residential Zone IV				Industrial Zone III		
	Residential Zone V				Industrial Zone IV		
	Residential Zone VI				Utility Zone I		
	Institutional Zone I				Utility Zone II		
	Institutional Zone II	2			Utility Zone III		
	Institutional Zone III				Transport Zone I	6	
	Authority Zone I	1			Transport Zone II		
	Authority Zone II				Transport Zone III		
	Special Zone						
				Total:		389	34ha

Additional Information:

Contours	
Pipeline	
Sewerage Line	
Powerlines	
Buildings	
High Voltage Powerlines	

MACROPLAN
TOWN & REGIONAL PLANNERS

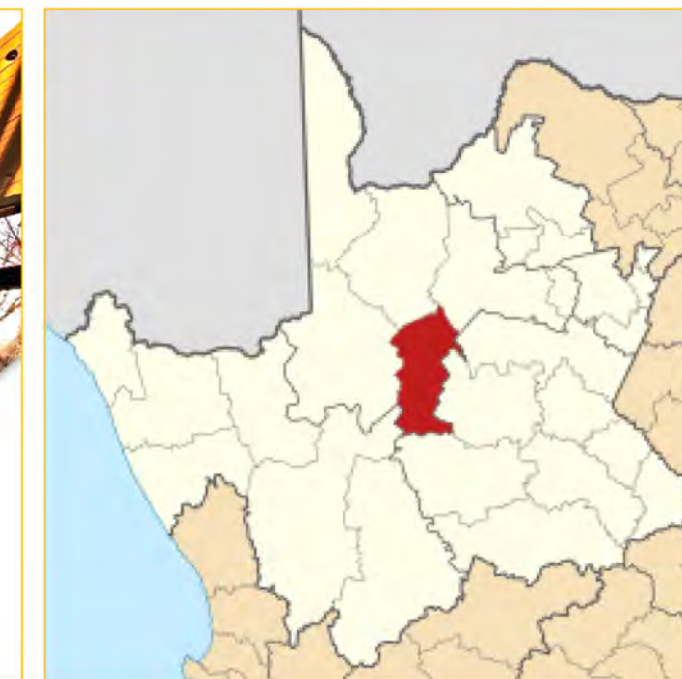
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Municipality

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ANNEXURE F: BOTANICAL ASSESSMENT



BOTANICAL ASSESSMENT

WEGDRAAI HOUSING PROJECT

PROPOSED FORMALIZATION AND DEVELOPMENT OF 360 NEW ERVEN
ON ERVEN 1, 45 & 47, WEGDRAAI,
!KHEIS LOCAL MUNICIPALITY, NORTHERN CAPE PROVINCE



17 July 2020

P.J.J. Botes (Pr.Sci.Nat: 400184/05)

Registered Professional Botanical, Environmental and Ecological Scientist

©

EXECUTIVE SUMMARY

VEGETATION TYPE	<p>Bushmanland Arid Grassland</p> <p>Classified as “Least Threatened” (GN 1002, December 2011) although statutory conservation targets have not yet been met.</p>
VEGETATION ENCOUNTERED	<p>Of the 43 ha footprint about 13 ha is transformed (illegal dumping, excavations) or settled. The remainder of the site was in poor condition as a result of illegal dumping windblown waste, urban related activities (trampling in Site 2, 3 & 4) or in just very disturbed. The ephemeral water courses to the southwest of Site 4 were in particular poor condition, being used as a dumping site and as one big toilet. Bushmanland Arid Grassland is not known for its high plant diversity, but the vegetation encountered was in exceptionally poor condition, which is probably the result of urban related activities and continual overgrazing coupled with the recent drought.</p>
CONSERVATION PRIORITY AREAS	<p>According to the Northern Cape CBA maps the proposed site falls within a CBA area. However, there is no alternative on Municipal land that will not impact on the CBA.</p> <p>The site will not impact on any recognised centre of endemism.</p>
CONNECTIVITY	<p>The transformation of the site will destroy connectivity on the site, but should not result in a significant impact on the surrounding area, where connectivity is still excellent.</p>
LAND-USE	<p>The footprint is on municipal land in close proximity to the town of Wegdraai. About 30% of the footprint is disturbed or already settled. The area is grazed by livestock, which can be seen in the poor condition of many of the plant species (coupled with the recent on-going drought).</p>
PROTECTED PLANT SPECIES	<p>The most significant botanical aspect of this site is the presence of a 4 protected <i>Vachellia erioloba</i> trees and 3 protected Sheppard trees (<i>Boscia albitrunca</i>) (refer to Table 2) and a number of Northern Cape Nature Conservation Act, protected species (Refer to Table 3).</p>
MAIN CONCLUSION	<p>The proposed development footprint is located on Municipal property, adjacent to existing town developments. The activity is expected to result in a permanent transformation of approximately 43 ha of land, of which approximately 70% is still covered by disturbed indigenous vegetation. The site overlaps an identified critical biodiversity area (according to the 2016, Northern Cape Critical Biodiversity Areas maps). In addition, protected Camel Thorn (<i>Vachellia erioloba</i>) and Sheppard trees (<i>Boscia albitrunca</i>), and a number of Northern Cape Nature Conservation Act, protected species were observed within the footprint.</p> <p>According to the impact assessment given in Table 6 the development is likely to result in a Medium-Low impact, which can be reduced to a Low impact with good environmental control during construction.</p> <p>With the correct mitigation it is unlikely that the development will contribute significantly to any of the following:</p> <ul style="list-style-type: none"> • Significant loss of vegetation type and associated habitat. • Loss of ecological processes (e.g. migration patterns, pollinators, river function etc.) due to construction and operational activities. • Loss of local biodiversity and threatened plant species. • Loss of ecosystem connectivity. <p>WITH THE AVAILABLE INFORMATION IT IS RECOMMENDED THAT PROJECT BE APPROVED, WITH THE PROPOSED MITIGATION ACTIONS.</p>
NO-GO OPTION	<p>The No-Go option is not likely to result in a “no-impact” scenario, as constant slow degradation is expected to continue as a result of urban activities and poor management of the site.</p> <p>There is also an urgent need for the establishment of additional residential erven in the !Kheis Municipality, which is likely to outweigh the No-Go option.</p>

INDEPENDENCE & CONDITIONS

PB Consult is an independent entity with no interest in the activity other than fair remuneration for services rendered. Remunerations for services are not linked to approval by decision making authorities and PB Consult have no interest in secondary or downstream development as a result of the authorization of this proposed project. There are no circumstances that compromise the objectivity of this report. The findings, results, observations and recommendations given in this report are based on the author's best scientific and professional knowledge and available information. PB Consult reserve the right to modify aspects of this report, including the recommendations if new information become available which may have a significant impact on the findings of this report.

RELEVANT QUALIFICATIONS & EXPERIENCE OF THE AUTHOR

Mr Peet Botes holds a BSc. (Hons.) degree in Plant Ecology from the University of Stellenbosch (Nature Conservation III & IV as extra subjects). Since qualifying with his degree, he had worked for more than 20 years in the environmental management field, first at the Overberg Test Range (a Division of Denel) managing the environmental department of OTR and being responsible for developing and implementing an ISO14001 environmental management system, ensuring environmental compliance, performing environmental risk assessments with regards to missile tests and planning the management of the 26 000 ha of natural veld, working closely with CapeNature (De Hoop Nature Reserve).

In 2005 he joined Enviroscientific, an independent environmental consultancy specializing in wastewater management, botanical and biodiversity assessments, developing environmental management plans and strategies, environmental control work as well as doing environmental compliance audits and was also responsible for helping develop the biodiversity part of the Farming for the Future audit system implemented by Woolworths. During his time with Enviroscientific he performed more than 400 biodiversity and environmental legal compliance audits.

During 2010 he joined EnviroAfrica in order to move back to the biodiversity aspects of environmental management. Experience with EnviroAfrica includes NEMA EIA applications, environmental management plans for various industries, environmental compliance audits, environmental control work as well as more than 70 biodiversity & botanical specialist studies.

Towards the end of 2017, Mr Botes started his own small environmental consulting business focusing on biodiversity & botanical assessments, biodiversity management plans and environmental compliance audits.

Mr Botes is a registered Professional Botanical, Environmental and Ecological Scientists at SACNASP (South African Council for Natural Scientific Professions) as required in terms of Section 18(1)(a) of the Natural Scientific Professions Act, 2003, since 2005.

DECLARATION OF INDEPENDENCE

THE INDEPENDENT PERSON WHO COMPILED A SPECIALIST REPORT OR UNDERTOOK A SPECIALIST PROCESS

I Petrus, Jacobus, Johannes Botes, as the appointed independent specialist hereby declare that I:

- act/ed as the independent specialist in this application;
- regard the information contained in this report as it relates to my specialist input/study to be true and correct, and
- do not have and will not have any financial interest in the undertaking of the activity, other than remuneration for work performed in terms of the NEMA, the Environmental Impact Assessment Regulations, 2014, as amended, and any specific environmental management Act;
- have and will not have no vested interest in the proposed activity proceeding;
- have disclosed, to the applicant, EAP and competent authority, any material information that have or may have the potential to influence the decision of the competent authority or the objectivity of any report, plan or document required in terms of the NEMA, the Environmental Impact Assessment Regulations, 2014 and any specific environmental management Act;
- am fully aware of and meet the responsibilities in terms of NEMA, the Environmental Impact Assessment Regulations, 2014 (specifically in terms of regulation 13 of GN No. R. 326) and any specific environmental management Act, and that failure to comply with these requirements may constitute and result in disqualification;
- have ensured that information containing all relevant facts in respect of the specialist input/study was distributed or made available to interested and affected parties and the public and that participation by interested and affected parties was facilitated in such a manner that all interested and affected parties were provided with a reasonable opportunity to participate and to provide comments on the specialist input/study;
- have ensured that the comments of all interested and affected parties on the specialist input/study were considered, recorded and submitted to the competent authority in respect of the application;
- have ensured that the names of all interested and affected parties that participated in terms of the specialist input/study were recorded in the register of interested and affected parties who participated in the public participation process;
- have provided the competent authority with access to all information at my disposal regarding the application, whether such information is favourable to the applicant or not; and
- am aware that a false declaration is an offence in terms of regulation 13 of GN No. R. 326.

Note: The terms of reference must be attached.



Signature of the specialist:

PB Consult (Sole Proprietor)

Name of company:

16 July 2020

Date:

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1. INTRODUCTION

There is an urgent need for the establishment of additional residential erven in the sub-economical market in the !Kheis Local Municipality. Seven towns have been identified for the proposed development of a number of new erven at each town. They are:

- Boegoeberg: 550 erven;
- Gariep: 135 erven;
- Groblershoop: 1500 erven;
- Grootdrink: 370 erven;
- Opwag: 730 erven;
- Topline: 248 erven; and
- Wegdraai: 360 erven.

Macroplan has been appointed by the Barzani Group (on behalf of COGHSTA) as Town and Regional Planners to manage the town planning process in terms of SPLUMA (Act 16 of 2013).

The proposed project will trigger listed activities under the National Environmental Management Act, (Act 107 of 1998) (NEMA) and the EIA regulations (as amended). As result EnviroAfrica was appointed to perform the NEMA EIA application and PB Consult was appointed to conduct a botanical assessment of the proposed sites, which, although disturbed in some areas, still supports natural vegetation.

This report refers to the proposed development of approximately 360 new erven on a 43 ha of municipal land adjacent to Wegdraai.

The proposed footprint supports one vegetation type namely, Bushveld Arid Grassland (considered “Least Threatened” in terms of the National list of ecosystems that are threatened and in need of protection). Desktop studies suggest that the veld may still be in good condition, and it overlaps a terrestrial critical biodiversity area (CBA1) as identified in the 2017 Northern Cape Biodiversity Spatial Plan.

The settlement of Wegdraai and its surrounding area was in very poor condition in terms of waste and sewage management. All the water courses seems to be used as toilets and dumping areas. Windblown litter was evident all over the site and its surroundings. Illegal dumping was done almost on every open area. The Municipality and the leaders of the settlement should take responsibility and install a more effective sewage management and waste removal or recycling system to be used by the people living at Wegdraai.

1.1. TERMS OF REFERENCE

The terms of reference for this appointment were to:

- Evaluate the proposed site(s) in order to determine whether any significant botanical features will be impacted as a result of the proposed development.
- Determine and record the position of any plant species of special significance (e.g. protected tree species, or rare or endangered plant species) that should be avoided or that may require “search & rescue” intervention.
- Locate and record sensitive areas from a botanical perspective within the proposed development footprint that may be interpreted as obstacles to the proposed development.
- Make recommendations on impact minimization should it be required
- Consider short- to long-term implications of impacts on biodiversity and highlight irreversible impacts or irreplaceable loss of species.

2. STUDY AREA

2.1. LOCATION & LAYOUT

Wegdraai is located just off the N10, about 14 km north of Groblershoop in the !Kheis Local Municipality of the Northern Cape Province (Figure 1). The proposed new erven will include the current settlement that has been established at Wegdraai, on Plot 2642, Boegoeberg Settlement and Portion 14 of the Farm Boegoeberg Settlement No. 48 (GPS Coordinates 28° 50' 30.57"S; 21° 51' 25.96"E).

Figure 1: Map showing the location of Wegdraai in relation to Upington and Groblershoop in the Northern Cape

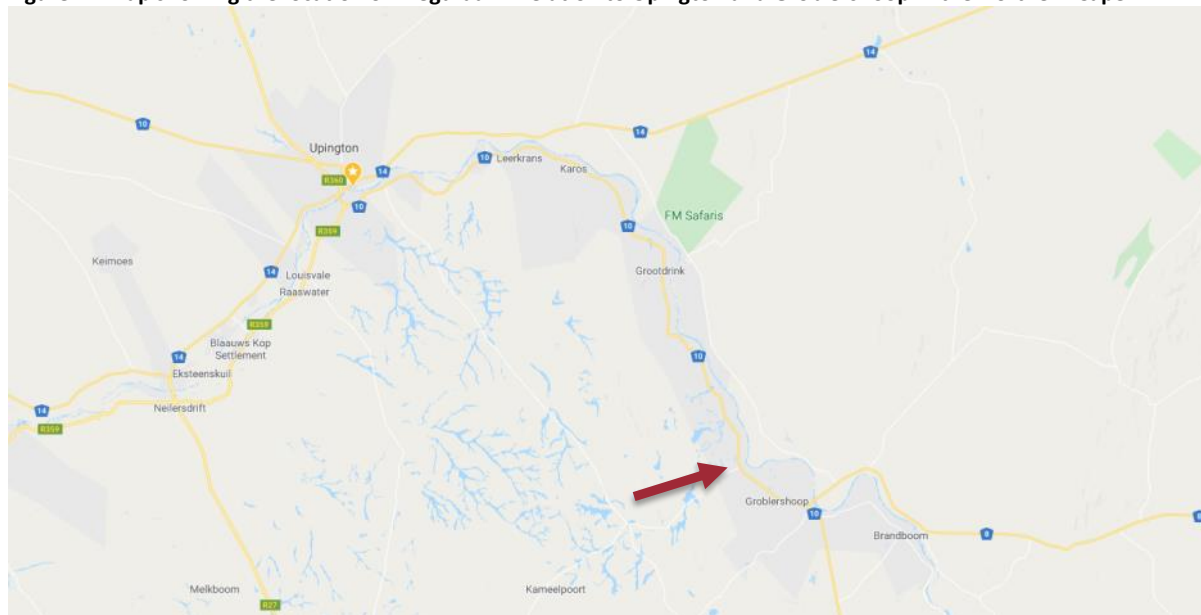


Figure 2: The proposed location of the new erven at Wegdraai



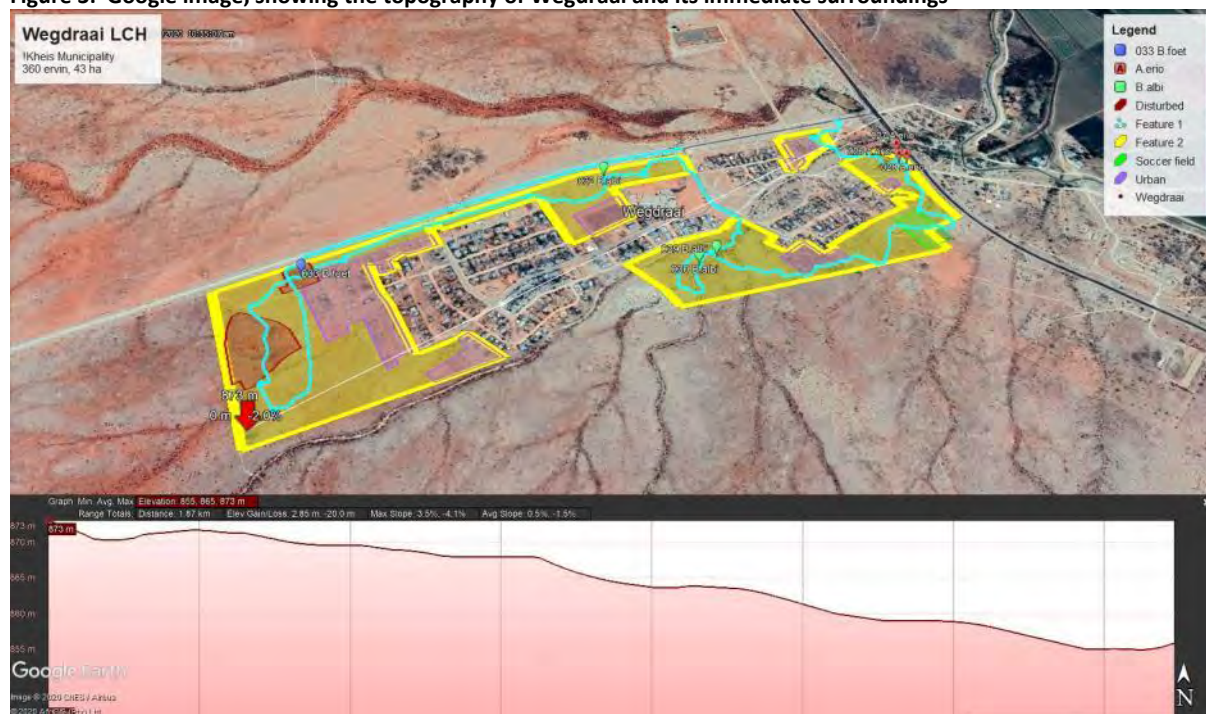
2.2. CLIMATE

All regions with a rainfall of less than 400 mm per year are regarded as arid. Wegdraai receives less than a 100 mm of rain per year, mainly in mid-summer December to March the highest (40 mm) in February/March, with its lowest rainfall (0 mm) during winter (June to August). It is also important to note that rainfall can be highly erratic and can vary significantly per annum on any specific location. Daily temperatures vary from 23°C – 37°C during the hot summer months (December / January) and drops down to between 8°C - 17°C during the colder winter months (June – July) (www.worldweatheronline.com).

2.3. TOPOGRAPHY & SOILS

The proposed Wegdraai settlement is located on slightly undulating landscape characterised by a number of ephemeral drainage lines, sloping northeast towards the Orange River (Figure 3). The average slope is 0.5%, with a maximum slope of 3.5%.

Figure 3: Google image, showing the topography of Wegdraai and its immediate surroundings



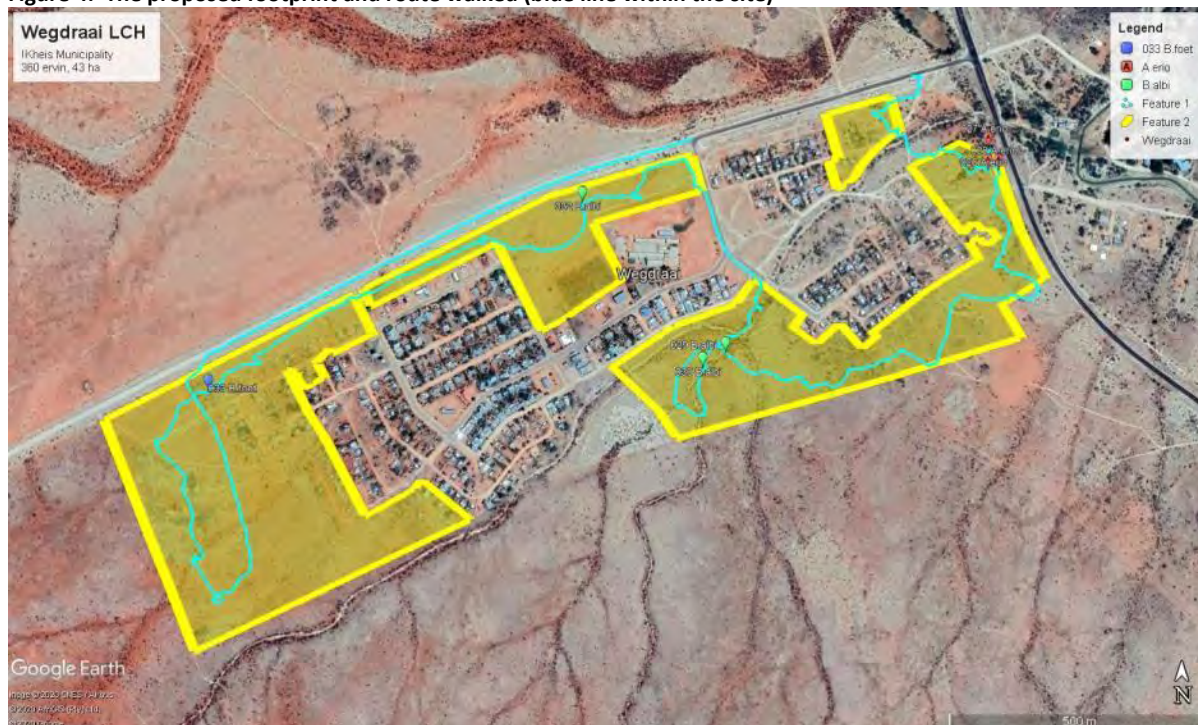
According to Mucina & Rutherford (2006), the geology for Bushmanland Arid Grassland vegetation is dominated by mudstones and shales of the Eccu Group (Prince Albert and Volksrust Formations) and Dwyka tillites, both of the early Karoo age. About 20% of rock outcrops are formed by Jurassic intrusive dolerite sheets and dykes. The soils are described as soils with minimal development, usually shallow on hard or weathering rock, Glenrosa and Mispah forms, with lime generally present in the entire landscape (Fc land type) and, to a lesser extent, red-yellow apedal, freely drained soils with a high base status and usually <15% clay (Ah and Ai land types) are also found. The salt content in these soils is very high. The soils on site were generally shallow on weathering rock with high quartz and calcrete content.

3. EVALUATION METHOD

Desktop studies coupled with a site visit were performed. The site visit was conducted on the 20th of May 2020. The timing of the site visit was reasonable in that, even though the veld was very dry, almost all perennial plants were identifiable.

It is important to note that the Northern Cape is currently in the midst of one of its worst drought periods in a long time, and although some summer rains had fallen (deducted from the presence of a number of grass species) it was not yet enough to really trigger a display of annual herbs.

Figure 4: The proposed footprint and route walked (blue line within the site)



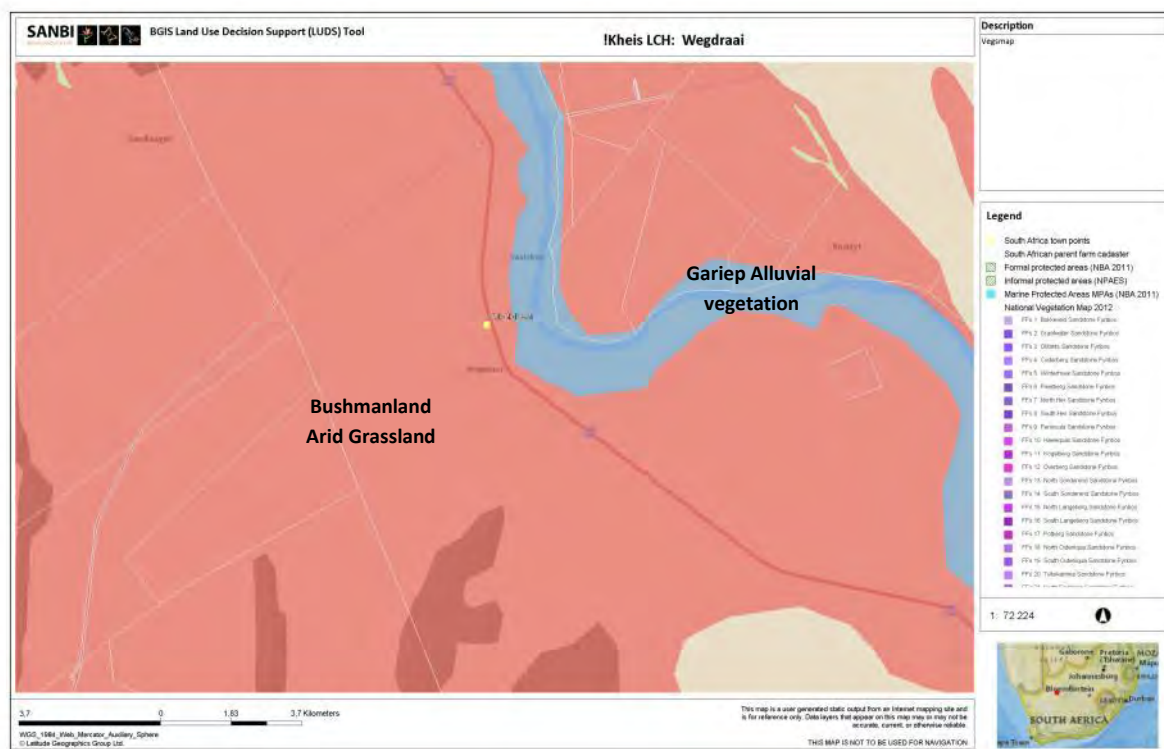
However, the author is confident that a fairly good understanding of the biodiversity status of the site was obtained. The survey was conducted by walking the site and examining, marking and photographing any area of interest. Confidence in the findings is high. During the site visit the author endeavoured to identify and locate all significant biodiversity features, special plant species and or specific soil conditions which might indicate special botanical features (e.g. rocky outcrops or silcrete patches).

4. THE VEGETATION

The Northern Cape contains about 3500 plant species in 135 families and 724 genera, with about 25% of this flora endemic to the region. It is also home to an exceptionally high level of insect and reptile endemism, with new species still being discovered. However, it must be noted that this remarkable diversity is not distributed evenly throughout the region, but is concentrated in many local centres of endemism. The Karoo used to support millions of antelope, mainly springbuck, but also numerous other larger antelope (and other grazing animal). These animals roamed the vast plains of the Karoo, utilizing different selections of plants and allowing for long “rest” periods as they move around, and as a result preventing overgrazing (Shearing, 1994).

The Wegdraai area would be classified as a desert region. In accordance with the Vegetation map of South Africa, Lesotho and Swaziland (Mucina & Rutherford, 2006, as updated in the 2012 beta version) only one broad vegetation type is expected within the proposed footprint, namely **Bushmanland Arid Grassland** (Figure 5). This vegetation type is classified as “Least Threatened” (GN 1002, December 2011) although statutory conservation targets have not yet been met.

Figure 5: Vegetation map of South Africa (2012 beta 2 version), showing the expected vegetation types



4.1. THE VEGETATION IN CONTEXT

4.1.1. Nama-Karoo Biome

Bushmanland Arid Grassland is part of the Nama-Karoo Biome, which is a large arid landlocked region on the central plateau of the western half of South Africa, extending into Namibia. It is flanked by the Succulent Karoo to the west and south, desert to the northwest, arid Kalahari Savanna to the north, Grassland to the northeast, Albany Thicket to the southeast and small parts of Fynbos to the south. In South Africa, only the Desert Biome has a higher variability in annual rainfall and only the Kalahari Savanna greater extremes in temperature. The Nama-Karoo receives most of its rainfall in summer, especially in late summer (Mucina *et al.*, 2006).

Climate is essentially continental and with almost no effect of the ameliorating influences of the oceans. Rainfall is low and unreliable, peaking in March. Droughts are unpredictable and often prolonged. Summers are hot and winters cold with temperature extremes ranging from -5°C in winter to 43°C in summer. However, rainfall intensity can be high (e.g. episodic thunderstorm and hail storm events). This coupled with the generally low vegetation cover associated with aridity and grazing pressure by domestic stock over the last two centuries, raises the potential for soil erosion. In semi-arid environments such as the Nama-Karoo, nutrients are generally located near the soil surface, making it vulnerable to sheet erosion (Mucina *et. al.*, 2006). In contrast with the Succulent Karoo, the Nama-Karoo is not particularly rich in plant species and does not contain any centre of endemism. Local endemism is very low, which might indicate a relative youthful biome linked to the remarkable geological and environmental homogeneity of the Nama-Karoo. Rainfall seasonality and frequency are too unpredictable and winter temperatures too low to enable leaf succulent dominance (as in the Succulent Karoo). It is also too dry in summer for dominance by perennial grasses alone and the soils generally to shallow and rainfall too low for dominance by trees. But soil type, soil depth and local differences in moisture availability can cause abrupt changes in vegetation structure and composition (e.g. small drainage lines support more plant species than surrounding plains) (Mucina *et. al.*, 2006).

4.2. VEGETATION ENCOUNTERED

The proposed development footprint is about 43 ha in size, divided in 4 units based on its location (Figure 6). Site 1 is located to the west of Wegdraai, Site 2 to the north-, Site 3 in the north eastern corner and Site 4 to the south of Wegdraai (Figure 6). Of this footprint about 13 ha are either disturbed (illegal dumping, excavations) or already settled. The remainder of the site was in poor condition as a result of illegal dumping windblown waste, grazing practices etc. The remaining natural veld was often trampled (Site 2, 3 & 4) or in poor condition. The ephemeral water courses to the southwest of Site 4 were in particular poor condition, being used as a dumping site and as one big toilet.

Figure 6: An overview of the site, showing most significant disturbed areas



4.2.1. Existing disturbance footprint

Figure 6 gives an overview of the disturbed areas, which includes;

- Purple areas: Areas already settled or being settled, about 8.68 ha in size (Photo 1 – Photo 4).
- Red areas: Areas of physical disturbance, which include waste disposal site, areas excavated or areas where spoil and other material were dumped (stored), about 3.33 ha in size (Photo 5 to Photo 13);
- Green area: Open playground (soccer field), about 0.92 ha in size (Photo 14).



Photo 1: Some of the areas already settled in Site 1 (Figure 6), looking from southwest to northeast towards Wegdraai.



Photo 2: Another photo of the existing settlement at Wegdraai (Site 1 in Figure 6).



Photo 3: Established housing towards the northwest of Wegdraai (Site 2 in Figure 6).



Photo 4: New erven being occupied to the south of Wegdraai (Site 4 in Figure 6).



Photo 5: Illegal dumping in the veld west of Wegdraai (in Site 1 in Figure 6).



Photo 6: Waste disposal site to the west of Wegdraai (in Site 1 in Figure 6), next to above picture.



Photo 7: Dumping of spoil in the red area to the west of Wegdraai (in Site 1 in Figure 6).



Photo 8: More illegal dumping in the red area to the west of Wegdraai (in Site 1 in Figure 6).



Photo 9: Further physical disturbances in the north-western corner of Site 1 (Figure 6).



Photo 10: Waste disposal in one of the watercourses to the south of Wegdraai (in Site 4 in Figure 6). These seasonal streams are also used for toilets and disposing of used nappies etc.



Photo 11: Another picture of waste disposal within the watercourses to the south of Wegdraai (in Site 4 in Figure 6). Note the old *Boscia albitrunca* within the watercourse.



Photo 12: Disturbed area to the south of Wegdraai (in Site 4 in Figure 6).



Photo 13: *Prosopis* invaded trampled veld to the east of Wegdraai (in Site 4 in Figure 6). Between Wegdraai and the N10.



Photo 14: Soccer field to the south of Wegdraai (in Site 4 in Figure 6).

4.2.2. Remaining natural veld

Of the 4 sites proposed for further development, only Site 1 and the south-western portion of Site 4 still supports indigenous vegetation of some note. But even here, most of the veld is degraded as a result of illegal dumping or other disturbances. Site 2, 3 and the eastern half of Site 4 are in poor condition with the veld trampled and often dominated by the alien invasive *Prosopis* tree. However, the presence of a few protected trees, most notably 3 *Vachellia erioloba* trees in the north eastern corner of the property (Site 4) and 3 old *Boscia albitrunca* trees next to the ephemeral streams in Site 4, gives some value to these areas (as it does for Site 2 & 3 where a few *Boscia albitrunca* shrubs in very poor condition were observed).



Photo 15: Typical sparse shrubland dominated by *Senegalia mellifera* encountered in Site 1 (west of Wegdraai). Note the windblown waste and goats in the background.

Site 1 was characterised by shallow to slightly deeper sandy soils on weathering rock dominated by calcrete (Photo 15 & Photo 16). The vegetation can be described as a medium shrubland (1 m in height) usually dominated by *Senegalia mellifera* (Swarthaak) in combination with *Tetraena decumbens* (=Zygophyllum) and *Justicia australis*. Species diversity was again very low, which is most probably the result of continuous overgrazing, the effect being so near to the urban edge coupled with the current drought conditions. Grasses were almost non-existent and the vegetation seemed to be reduced to hardy or pioneer species.



Photo 16: The veld towards the south western corner of Site 1 (shallow soils with calcrete prominent).

The vegetation in Site 2 and 3 (Photo 18 & Photo 19) was mostly reduced to an open trampled terrain with almost no indigenous vegetation left, while some of the areas were overgrown with the alien invasive *Prosopis* tree (Photo 13).



Photo 17: One of shrub *Boscia foetida* individual observed in Site 1. Note the poor condition of the plant.



Photo 18: Typical disturbed veld observed in Site 2. Almost the only species left is the low growing and hardy *Tetraena decumbens*



Photo 19: One of the remaining *Boscia albitrunca* in Site 2.

Because of the number of drainage lines the remaining natural veld in the south western corner of Site 4 gives the impression of being a larger and denser vegetation type. However, this is just the effect of the denser stands of *Senegalia mellifera* associated with these streams (**Photo 19** Photo 20 & Photo 21). A couple of beautiful old *Boscia albitrunca* trees were observed next to the ephemeral streams in this area (Photo 21).



Photo 20: Denser stands of *Senegalia mellifera* associated with one of the drainage lines



Photo 21: One of magnificent and old *Boscia albitrunca* individuals observed next these ephemeral streams.

The *Boscia albitrunca* individuals were scattered throughout the site, but the most prominent ones were associated with the ephemeral streams in the south-western corner of Site 4 where it is unlikely to be impacted by the proposed development. The *Vachellia erioloba* trees, on the other hand were only encountered in the north-eastern corner of Site 4.



Photo 22: Two of the *Vachellia erioloba* trees observed next to the ephemeral stream between Site 3 & 4 (in the north eastern corner of the site).

The following plants were observed, scattered throughout the footprint: *Aloe claviflora* (very common), *Aptosimum spinescens*, *Cynanchum viminale*, *Euphorbia gariepina*, *Kleinia longiflora*, *Lycium cinereum*, *Mesembryanthemum subnodosum*, *Phaeoptilum spinosum*, *Radyera urens*, *Rhigozum trichotomum*, *Salsola zeyheri* and *Tetraena rigida*.

As is typical in the Bushmanland Grassland vegetation the ephemeral drainage lines are also associated with denser and higher shrub layer (Photo 10, Photo 20 & Photo 21). In this case the vegetation associated with these water courses were dominated by *Senegalia mellifera* and larger shrubs like *Lycium cinereum* and *Phaeoptilum spinosum*.

4.3. CRITICAL BIODIVERSITY AREAS MAPS

The Northern Cape CBA Map (2016) identifies biodiversity priority areas, called Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs), which, together with protected areas, are important for the persistence of a viable representative sample of all ecosystem types and species as well as the long-term ecological functioning of the landscape as a whole (Holness & Oosthuysen, 2016). The 2016 Northern Cape Critical Biodiversity Area (CBA) Map updates, revises and replaces all older systematic biodiversity plans and associated products for the province (including the Namakwa District Biodiversity Sector Plan, 2008). Priorities from existing plans such as the Namakwa District Biodiversity Plan, the Succulent Karoo Ecosystem Plan, National Estuary Priorities, and the National Freshwater Ecosystem Priority Areas were incorporated. Targets for terrestrial ecosystems were based on established national targets, while targets used for other features were aligned with those used in other provincial planning processes.

Critical biodiversity areas (CBA's) are terrestrial and aquatic features in the landscape that are critical for retaining biodiversity and supporting continued ecosystem functioning and services (SANBI 2007). The primary purpose of CBA's is to inform land-use planning in order to promote sustainable development and protection of important natural habitat and landscapes. CBA's can also be used to inform protected area expansion and development plans.

- **Critical biodiversity areas (CBA's)** are areas of the landscape that need to be maintained in a natural or near-natural state in order to ensure the continued existence and functioning of species and ecosystems and the delivery of ecosystem services. In other words, if these areas are not maintained in a natural or near-natural state then biodiversity conservation targets cannot be met. Maintaining an area in a natural state can include a variety of biodiversity-compatible land uses and resource uses.
- **Ecological support areas (ESA's)** are areas that are not essential for meeting biodiversity representation targets/thresholds but which nevertheless play an important role in supporting the

4.5. FLORA ENCOUNTERED

Table 2 gives a list of the plant species encountered during this study. Because of the limitations (timing and a single site visit as well as the drought) it is likely that a number of annuals might have been missed.

Table 1: List of indigenous species encountered within or near the proposed footprint

No.	Species name	FAMILY	Status	Alien & invader plant (AIP)
1.	<i>Aloe cf. gariensis</i>	ASPODELACEAE	LC NCNCA, Schedule 2 Protected (all species in this Family)	Apply for a NCNCA Flora permit (DENC)
2.	<i>Aloe claviflora</i>	ASPODELACEAE	LC NCNCA, Schedule 2 Protected (all species in this Family)	Apply for a NCNCA Flora permit (DENC)
3.	<i>Aptosimum spinescens</i>	SCROPHULARIACEAE	LC	
4.	<i>Boscia albitrunca</i>	BRASSICACEAE (CAPPARACEAE)	LC NFA protected species NCNCA, Schedule 2 Protected (all species of Boscia)	Apply for a NFA Tree permit (DAFF) Apply for a NCNCA Flora permit (DENC)
5.	<i>Boscia foetida</i>	BRASSICACEAE (CAPPARACEAE)	LC NCNCA, Schedule 2 Protected (all species in this Genus)	Apply for a NCNCA Flora permit (DENC)
6.	<i>Cynanchum viminalis</i> (=Sarcostemma viminalis)	APOCYNACEAE	LC NCNCA, Schedule 2 Protected (all species in this Family)	Apply for a NCNCA Flora permit (DENC)
7.	<i>Euphorbia gariensis</i>	EUPHORBIACEAE	NCNCA, Schedule 2 Protected (all species in this Genus)	Apply for a NCNCA Flora permit (DENC)
8.	<i>Justicia australis</i> (=Monechma genistifolium)	ACANTHACEAE	LC	
9.	<i>Kleinia longiflora</i>	ASTERACEAE	LC	
10.	<i>Lycium cinereum</i>	SOLANACEAE	LC	
11.	<i>Mesembryanthemum subnodosum</i> (=Psilocaulon subnodosum)	AIZOACEAE	LC NCNCA, Schedule 2 Protected (all species in this Genus)	Apply for a NCNCA Flora permit (DENC)
12.	<i>Phaeoptilum spinosum</i>	NYCTAGINACEAE	LC	
13.	<i>Radyera urens</i>	MALVACEAE	LC	
14.	<i>Rhigozum trichotomum</i>	BIGONACEAE	LC	
15.	<i>Salsola zeyheri</i>	AMARANTHACEAE	LC	
16.	<i>Senegalia mellifera</i> (=Acacia mellifera)	FABACEAE	LC	
17.	<i>Tapinanthus oleifolius</i>	LORANTHACEAE	LC	
18.	<i>Tetraena decumbens</i> (=Zygophyllum decumbens)	ZYGOPHYLLACEAE	LC	
19.	<i>Tetraena rigida</i> (=Zygophyllum rigidum)	ZYGOPHYLLACEAE	LC	

4.6. THREATENED AND PROTECTED PLANT SPECIES

South Africa has become the first country to fully assess the status of its entire flora. Major threats to the South African flora are identified in terms of the number of plant taxa Red-Listed as threatened with extinction as a result of threats like, habitat loss (e.g. infrastructure development, urban expansion, crop cultivation and mines), invasive alien plant infestation (e.g. outcompeting indigenous plant species), habitat degradation (e.g. overgrazing, inappropriate fire management etc.), unsustainable harvesting, demographic factors, pollution, loss of pollinators or dispersers, climate change and natural disasters (e.g. such as droughts and floods). South Africa uses the internationally endorsed IUCN Red List Categories and Criteria in the Red List of South African plants. However, due to its strong focus on determining risk of extinction, the IUCN system does not highlight

species that are at low risk of extinction, but may nonetheless be of high conservation importance. As a result a SANBI uses an amended system of categories in order to highlight species that may be of low risk of extinction but are still of conservation concern (SANBI, 2015).

In the Northern Cape, species of conservation concern are also protected in terms of national and provincial legislation, namely:

- The National Environmental Management: Biodiversity Act, Act 10 of 2004, provides for the protection of species through the “*Lists of critically endangered, endangered, vulnerable and protected species*” (GN. R. 152 of 23 February 2007).
- National Forest Act, Act 84 of 1998, provides for the protection of forests as well as specific tree species through the “*List of protected tree species*” (GN 908 of 21 November 2014).
- Northern Cape Nature Conservation Act, Act of 2009, provides for the protection of “*specially protected species*” (Schedule 1), “*protected species*” (Schedule 2) and “*common indigenous species*” (Schedule 3).

4.6.1. Red list of South African plant species

The Red List of South African Plants online provides up to date information on the national conservation status of South Africa’s indigenous plants (SANBI, 2015).

- **No red-listed species** was observed.

4.6.2. NEM: BA protected plant species

The National Environmental Management: Biodiversity Act, Act 10 of 2004, provides for the protection of species through the “*Lists of critically endangered, endangered, vulnerable and protected species*” (GN. R. 152 of 23 February 2007).

- **No NEM: BA protected species** was observed.

4.6.3. NFA Protected plant species

The National Forests Act (NFA) of 1998 (Act 84 of 1998) provides for the protection of forests as well as specific tree species (as updated).

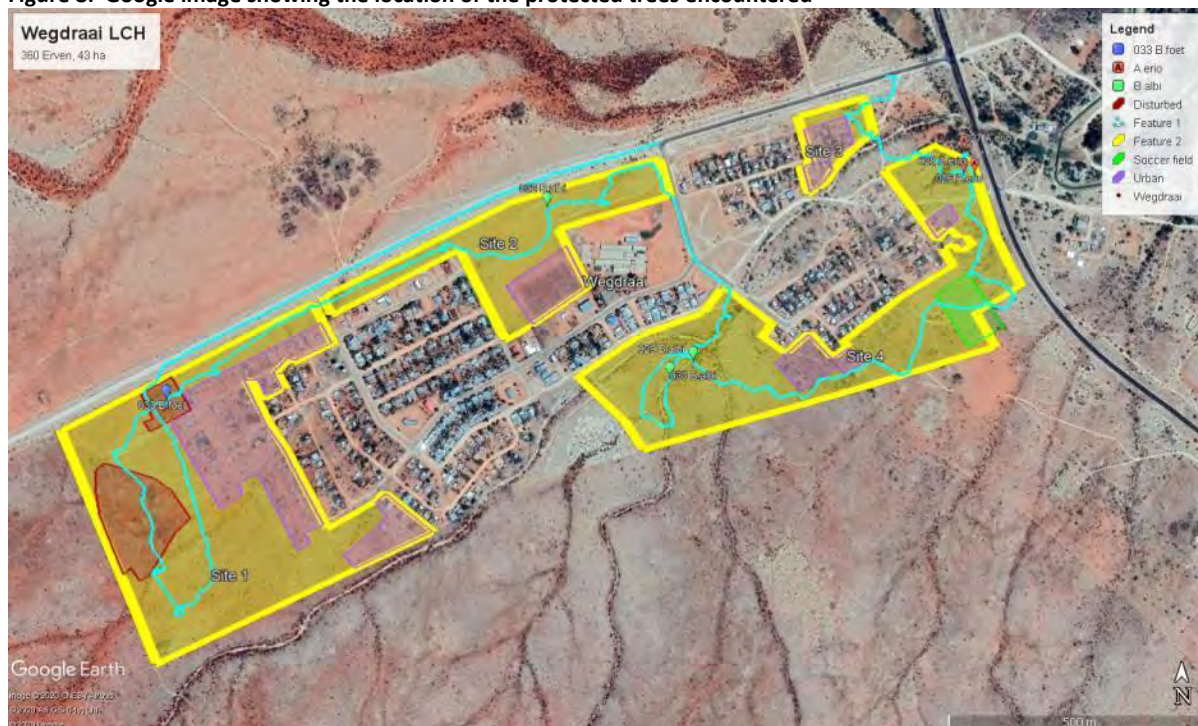
- **Two species protected in terms of the NFA** was observed, namely *Vachellia erioloba* and *Boscia albitrunca*. Table 2 and Figure 8 give locations for each tree as well as recommendations for impact minimisation. A NFA permit as well as a NCNCA permit will be required for the removal of these plants.

Table 2: Location of NFA protected trees observed within or near the footprint

NO.	SPECIES NAME	COMMENTS	RECOMMENDATIONS
026 V erio	<i>Vachellia erioloba</i> S28° 50' 09.9" E21° 52' 18.3"	Medium sized tree (2.2 m tall) in good condition	To be protected.
027 V erio	<i>Vachellia erioloba</i> S28° 50' 08.5" E21° 52' 18.4"	2 x Medium sized tree (3.8 & 3.6 m tall, respectively) in good condition (Photo 22).	To be protected. Located outside the proposed footprint.
028 V erio	<i>Vachellia erioloba</i> S28° 50' 09.9" E21° 52' 19.1"	Medium sized tree (2.8 m tall) in good condition	To be protected. Located just inside the proposed footprint.

NO.	SPECIES NAME	COMMENTS	RECOMMENDATIONS
029 B albi	<i>Boscia albitrunca</i> S28° 50' 21.5" E21° 51' 59.2"	Magnificent tree (4 m tall) in good condition (Photo 21).	To be protected Located next to a watercourse.
030 B albi	<i>Boscia albitrunca</i> S28° 50' 22.5" E21° 51' 57.6"	Big tree (3 m tall) in good condition, although subject to trimming (Photo 11).	To be protected Located next to a watercourse.
032 B albi	<i>Boscia albitrunca</i> S28° 50' 12.0" E21° 51' 49.0"	Medium tree (2.8 m tall) in good condition (Photo 19)	To be protected Located outside proposed footprint.

Figure 8: Google image showing the location of the protected trees encountered





4.6.4. NCNCA protected plant species

The Northern Cape Nature Conservation Act 9 of 2009 (NCNCA) came into effect on the 12th of December 2011, and also provides for the sustainable utilization of wild animals, aquatic biota and plants. Schedule 1 and 2 of the act give extensive lists of specially protected and protected fauna and flora species in accordance with this act. NB. Please note that all indigenous plant species are protected in terms of Schedule 3 of this act (e.g. any work within a road reserve).

- The following species protected in terms of the NCNCA were encountered. Recommendations on impact minimisation also included.

Table 3: Plant species protected in terms of the NCNCA encountered within the study area

NO.	SPECIES NAME	COMMENTS	RECOMMENDATIONS
1.	<i>Aloe claviflora</i> Schedule 2 protected	Very common throughout the site	Very common plant in this area. Protection through topsoil conservation.

NO.	SPECIES NAME	COMMENTS	RECOMMENDATIONS
2.	<i>Aloe gariensis</i> Schedule 2 protected		Search & rescue: Only 2 individuals observed. Individuals within footprint to be transplanted to surrounding area.
3.	<i>Boscia albitrunca</i> Schedule 2 protected		Refer to Table 2.
4.	<i>Boscia foetida</i> Schedule 2 protected	A few individuals observed, almost all in poor condition.	<i>Boscia</i> is unlikely to transplant successfully, because of its deep root system. Protect individuals where possible.
5.	<i>Cynanchum viminalis</i> Schedule 2 protected	Occasionally observed within the footprint.	Larger <i>Cynanchum</i> plants are expected to transplant poorly. Species protection through topsoil conservation.
6.	<i>Euphorbia gariensis</i> Schedule 2 protected		Occasionally observed. Larger <i>Euphorbia</i> tends to transplant very poorly. Species protection through topsoil conservation.

5. IMPACT ASSESSMENT METHOD

The objective of this study was to evaluate the botanical diversity of the property area in order to identify significant environmental features which might have been impacted as a result of the development. The Ecosystem Guidelines for Environmental Assessment (De Villiers *et. al.*, 2005), were used to evaluate the botanical significance of the property with emphasis on:

- Significant ecosystems
 - Threatened or protected ecosystems
 - Special habitats
 - Corridors and or conservancy networks
- Significant species
 - Threatened or endangered species
 - Protected species

5.1. DETERMINING SIGNIFICANCE

Determining impact significance from predictions of the nature of the impact has been a source of debate and will remain a source of debate. The author used a combination of scaling and weighting methods to determine significance based on a simple formula. The formula used is based on the method proposed by Edwards (2011). However, the criteria used were adjusted to suite its use for botanical assessment. In this document significance rating was evaluated using the following criteria (Refer to Table 4).

Significance = Conservation Value x (Likelihood + Duration + Extent + Severity) (Edwards 2011)

Table 4: Categories and criteria used for the evaluation of the significance of a potential impact

ASPECT / CRITERIA	LOW (1)	MEDIUM/LOW (2)	MEDIUM (3)	MEDIUM/HIGH (4)	HIGH (5)
CONSERVATION VALUE Refers to the intrinsic value of an attribute or its relative importance towards the conservation of an ecosystem or species or even natural aesthetics. Conservation status is based on habitat function, its vulnerability to loss and	The attribute is transformed, degraded not sensitive (e.g. Least threatened), with unlikely possibility of species loss.	The attribute is in good condition but not sensitive (e.g. Least threatened), with unlikely possibility of species loss.	The attribute is in good condition, considered vulnerable (threatened), or falls within an ecological support area or a critical biodiversity area, but with	The attribute is considered endangered or, falls within an ecological support area or a critical biodiversity area, or provides core habitat for endemic or rare &	The attribute is considered critically endangered or is part of a proclaimed provincial or national protected area.

ASPECT / CRITERIA	LOW (1)	MEDIUM/LOW (2)	MEDIUM (3)	MEDIUM/HIGH (4)	HIGH (5)
fragmentation or its value in terms of the protection of habitat or species			unlikely possibility of species loss.	endangered species.	
LIKELIHOOD Refers to the probability of the specific impact occurring as a result of the proposed activity	Under normal circumstances it is almost certain that the impact will not occur.	The possibility of the impact occurring is very low, but there is a small likelihood under normal circumstances.	The likelihood of the impact occurring, under normal circumstances is 50/50, it may or it may not occur.	It is very likely that the impact will occur under normal circumstances.	The proposed activity is of such a nature that it is certain that the impact will occur under normal circumstances.
DURATION Refers to the length in time during which the activity is expected to impact on the environment.	Impact is temporary and easily reversible through natural process or with mitigation. Rehabilitation time is expected to be short (1-2 years).	Impact is temporary and reversible through natural process or with mitigation. Rehabilitation time is expected to be relative short (2-5 years).	Impact is medium-term and reversible with mitigation, but will last for some time after construction and may require on-going mitigation. Rehabilitation time is expected to be longer (5-15 years).	Impact is long-term and reversible but only with long term mitigation. It will last for a long time after construction and is likely to require on-going mitigation. Rehabilitation time is expected to be longer (15-50 years).	The impact is expected to be permanent.
EXTENT Refers to the spatial area that is likely to be impacted or over which the impact will have influence, should it occur.	Under normal circumstances the impact will be contained within the construction footprint.	Under normal circumstances the impact might extent outside of the construction site (e.g. within a 2 km radius), but will not affect surrounding properties.	Under normal circumstances the impact might extent outside of the property boundaries and will affect surrounding land owners or – users, but still within the local area (e.g. within a 50 km radius).	Under normal circumstances the impact might extent to the surrounding region (e.g. within a 200 km radius), and will regional land owners or –users.	Under normal circumstances the effects of the impact might extent to a large geographical area (>200 km radius).
SEVERITY Refers to the direct physical or biophysical impact of the activity on the surrounding environment should it occur.	It is expected that the impact will have little or no affect (barely perceptible) on the integrity of the surrounding environment. Rehabilitation not needed or easily achieved.	It is expected that the impact will have a perceptible impact on the surrounding environment, but it will maintain its function, even if slightly modified (overall integrity not compromised). Rehabilitation easily achieved.	It is expected that the impact will have an impact on the surrounding environment, but it will maintain its function, even if moderately modified (overall integrity not compromised). Rehabilitation easily achieved.	It is expected that the impact will have a severe impact on the surrounding environment. Functioning may be severely impaired and may temporarily cease. Rehabilitation will be needed to restore system integrity.	It is expected that the impact will have a very severe to permanent impact on the surrounding environment. Functioning irreversibly impaired. Rehabilitation often impossible or unfeasible due to cost.

5.2. SIGNIFICANCE CATEGORIES

The formal NEMA EIA application process was developed to assess the significance of impacts on the surrounding environment (including socio-economic factors), associated with any specific development proposal in order to allow the competent authority to make informed decisions. Specialist studies must advise the environmental assessment practitioner (EAP) on the significance of impacts in his field of specialty. In order to do this, the specialist must identify all potentially significant

environmental impacts, predict the nature of the impact and evaluate the significance of that impact should it occur. Potential significant impacts are evaluated, using the method described above, in order to determine its potential significance. The potential significance is then described in terms of the categories given in Table 5.

Table 5: Categories used to describe significance rating (adjusted from DEAT, 2002)

SIGNIFICANCE	DESCRIPTION
Insignificant or Positive (4-22)	There is no impact or the impact is insignificant in scale or magnitude as a result of low sensitivity to change or low intrinsic value of the site, or the impact may be positive.
Low (23-36)	An impact barely noticeable in scale or magnitude as a result of low sensitivity to change or low intrinsic value of the site, or will be of very short-term or is unlikely to occur. Impact is unlikely to have any real effect and no or little mitigation is required.
Medium Low (37-45)	Impact is of a low order and therefore likely to have little real effect. Mitigation is either easily achieved. Social, cultural and economic activities can continue unchanged, or impacts may have medium to short term effects on the social and/or natural environment within site boundaries.
Medium (46-55)	Impact is real, but not substantial. Mitigation is both feasible and fairly easily possible, but may require modification of the project design or layout. Social, cultural and economic activities of communities may be impacted, but can continue (albeit in a different form). These impacts will usually result in medium to long term effect on the social and/or natural environment, within site boundary.
Medium high (56-63)	Impact is real, substantial and undesirable, but mitigation is feasible. Modification of the project design or layout may be required. Social, cultural and economic activities may be impacted, but can continue (albeit in a different form). These impacts will usually result in medium to long-term effect on the social and/or natural environment, beyond site boundary within local area.
High (64-79)	An impact of high order. Mitigation is difficult, expensive, time-consuming or some combination of these. Social, cultural and economic activities of communities are disrupted and may come to a halt. These impacts will usually result in long-term change to the social and/or natural environment, beyond site boundaries, regional or widespread.
Unacceptable (80-100)	An impact of the highest order possible. There is no possible mitigation that could offset the impact. Social, cultural and economic activities of communities are disrupted to such an extent that these come to a halt. The impact will result in permanent change. Very often these impacts cannot be mitigated and usually result in very severe effects, beyond site boundaries, national or international.

6. DISCUSSING BOTANICAL SENSITIVITY

The aim of impact assessment is to determine the vulnerability of a habitat to a specific impact. In order to do so, the sensitivity of the habitat should be determined by identifying and assessing the most significant environmental aspects of the site against the potential impact(s). For this development the following biodiversity aspects was considered:

- **Location**: The proposed development footprint is located on Municipal property, next to the existing town. Portions of the proposed footprint had already been settled.
- **Activity**: The proposed activity is expected to result in a permanent transformation of approximately 43 ha of land, of which more than 70% is still covered by disturbed indigenous vegetation.
- **Geology & Soils**: No special features such as true quartz patches or heuweltjies were observed in or near to the larger footprint area that may result in specialised plant habitat.
- **Land use and cover**: The footprint is on municipal land in close proximity to the town of Wegdraai. About 30% of the footprint is disturbed or already settled. The area is grazed by livestock, which can be seen in the poor condition of many of the plant species (coupled with the recent on-going drought).
- **Vegetation status**: The vegetation is not considered a threatened vegetation type, but conservation targets have not yet been met. Of the 43 ha footprint about 13 ha is transformed (illegal dumping, excavations) or settled. The remainder of the site was in poor condition as a result of illegal dumping windblown waste, urban related activities (trampling in Site 2, 3 & 4) or in just very disturbed. The ephemeral water courses to the southwest of Site 4 were in particular poor condition, being used as a dumping site and as one big toilet.
- **Conservation priority areas**: According to the Northern Cape CBA maps the proposed site falls within a CBA area. However, there is no alternative on Municipal land that will not impact on the CBA. The site will not impact on any recognised centre of endemism.
- **Connectivity**: The transformation of the site will destroy connectivity on the site, but should not result in a significant impact on the surrounding area, where connectivity is still excellent.
- **Watercourses and wetlands**: Not evaluated in this study as a separate freshwater impact assessment has been commissioned as part of the NEMA EIA process.
- **Protected or endangered plant species**: The most significant botanical aspect of this site is the presence of a 4 protected *Vachellia erioloba* trees and 3 protected Sheppard trees (*Boscia albitrunca*) (refer to Table 2) and a number of Northern Cape Nature Conservation Act, protected species (Refer to Table 3).
- **Alien and Invasive Plant species**: Portions of the site has been heavily invaded by the alien invasive *Prosopis* tree. These plants should be removed responsibly before development commence.

6.1. IMPACT ASSESSMENT

Table 6 rates the significance of environmental impacts associated with the proposed development. It also evaluates the expected accumulative effect of the proposed development as well as the No-Go option.

Table 6: Impact assessment associated with the proposed development

Impact assessment								
Aspect	Mitigation	CV	Lik	Dur	Ext	Sev	Significance	Short discussion
Geology & soils: Potential impact on special habitats (e.g. true quartz or "heuweltjies")	Without mitigation	2	1	5	2	1	18	No special habitats observed.
	With mitigation	2	1	3	1	1	12	Refer to recommendations for NFA- & NCNCA protected plant species (Table 2 & 3).
Landuse and cover: Potential impact on socio-economic activities.	Without mitigation	2	3	5	1	2	22	Permanent transformation of approximately 43ha of indigenous vegetation used for grazing.
	With mitigation	2	2	3	1	1	14	Potential beneficial socio-economic impact (much needed housing project).
Vegetation status: Loss of vulnerable or endangered vegetation and associated habitat.	Without mitigation	2	3	5	2	2	24	Permanent transformation of 43 ha of disturbed Bushmanland Arid Grassland (Least Threatened).
	With mitigation	2	2	3	2	2	18	Refer to recommendations for NFA- & NCNCA protected plant species (Table 2 & 3).
Conservation priority: Potential impact on protected areas, CBA's, ESA's or Centre's of Endemism.	Without mitigation	3	3	5	2	2	36	The development will impact on a proposed CBA. However, there is no alternative location on the property that will not impact on the same CBA.
	With mitigation	2	2	3	1	1	14	Refer to recommendations for NFA- & NCNCA protected plant species (Table 2 & 3).
Connectivity: Potential loss of ecological migration corridors.	Without mitigation	2	3	5	2	2	24	The transformation will destroy connectivity within the site, but will not result in a significant impact on the surrounding area, where connectivity is still excellent
	With mitigation	2	2	3	2	2	18	Refer to recommendations for NFA- & NCNCA protected plant species (Table 2 & 3).
Watercourses and wetlands: Potential impact on natural water courses and its ecological support areas.	Without mitigation						0	N/a (Refer to the Freshwater specialist report).
	With mitigation						0	
Protected & endangered plant species: Potential impact on threatened or protected plant species.	Without mitigation	3	3	5	2	3	39	A number of protected species were observed, most notably a number of nationally protected tree species.
	With mitigation	2	2	3	1	1	14	Refer to recommendations for NFA- & NCNCA protected plant species (Table 2 & 3).

Impact assessment								
Aspect	Mitigation	CV	Lik	Dur	Ext	Sev	Significance	Short discussion
Invasive alien plant species: Potential invasive plant infestation as a result of the activities.	Without mitigation	3	3	4	2	2	33	For most of the property, only the occasional Prosopis trees were observed. However, towards the northern portions of the site, denser stands were observed.
	With mitigation	2	1	2	1	1	10	Special care must be taken during their removal (in order to avoid re-sprouting).
Veld fire risk: Potential risk of veld fires as a result of the activities.	Without mitigation	1	2	3	2	2	9	Veld fire risk low.
	With mitigation	1	1	1	1	1	4	Address fire danger throughout construction.
Cumulative impacts: Cumulative impact associated with proposed activity.	Without mitigation	3	3	5	2	2	36	Permanent transformation of approximately 49 ha of natural veld for urban development.
	With mitigation	2	2	3	2	2	18	Refer to all the mitigation recommendations above.
The "No-Go" option: Potential impact associated with the No-Go alternative.	Without mitigation	3	3	4	2	2	33	Slow degradation of natural veld as a result of illegal dumping, physical disturbances and grazing practices.
	With mitigation						0	

According Table 6, the main impacts associated with the proposed development will be:

- The transformation of 43 ha of indigenous vegetation within a proposed CBA; and
- The potential impact on a number of nationally protected trees as well as provincially protected plant species.

However, there is no logical alternative site, located on Municipal land that will not impact on the same CBA. In this case, about 30% of the proposed footprint is already impacted as result of existing settlement and the remaining veld can only be described as disturbed.

The No-Go option is not likely to result in a “no-impact” scenario, as constant slow degradation is expected to continue as a result of urban activities and poor management of the site.

The cumulative impact (even without mitigation) is expected to be **Medium-Low**, which can be reduced to **Low** through mitigation.

7. IMPACT MINIMISATION RECOMMENDATIONS

The proposed development footprint is located on Municipal property, adjacent to existing town developments. The activity is expected to result in a permanent transformation of approximately 43 ha of land, of which approximately 70% is still covered by disturbed indigenous vegetation. The site overlaps an identified critical biodiversity area (according to the 2016, Northern Cape Critical Biodiversity Areas maps). In addition, protected Camel Thorn (*Vachellia erioloba*) and Sheppard trees (*Boscia albitrunca*), and a number of Northern Cape Nature Conservation Act, protected species were observed within the footprint.

According to the impact assessment given in Table 6 the development is likely to result in a **Medium-Low** impact, which can be reduced to a **Low** impact with good environmental control during construction.

With the correct mitigation it is unlikely that the development will contribute significantly to any of the following:

- Significant loss of vegetation type and associated habitat.
- Loss of ecological processes (e.g. migration patterns, pollinators, river function etc.) due to construction and operational activities.
- Loss of local biodiversity and threatened plant species.
- Loss of ecosystem connectivity.

7.1. MITIGATION ACTIONS

The following mitigation actions should be implemented to ensure that the proposed development does not pose a significant threat to the environment:

- All construction must be done in accordance with an approved construction and operational phase Environmental Management Plan (EMP), which must include the recommendations made in this report.
- A suitably qualified Environmental Control Officer must be appointed to monitor the construction phase in terms of the EMP and any other conditions pertaining to specialist studies.
- **Before any work is done** protected tree species must be marked and demarcated (Refer to Table 2).
- **Before any work is done** search & rescue as discussed in Table 3 must be completed.
- Lay-down areas or construction sites must be located within the construction footprint.
- No clearing of any area outside of the construction footprint may be allowed.
- All waste that had been illegally dumped within the footprint must be removed to a Municipal approved waste disposal site.
- An integrated waste management approach must be implemented during construction.
 - Construction related general and hazardous waste may only be disposed of at Municipal approved waste disposal sites.
- Alien invasive *Prosopis* plants within the footprint (and immediate surroundings) must be removed in a responsible way (to ensure against regrowth).
- The Municipality must ensure that adequate waste and sewerage facilities and or services are established to service this community.

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APPENDIX 1: COMPLIANCE WITH APPENDIX 6 OF GN. No. 982 (4 DECEMBER 2014)

Specialist reports

1. A specialist report prepared in terms of these regulations must contain -	
a) Details of –	Refer to:
(i) The specialist who prepared the report; and	Refer to Page ii & Appendix 2
(ii) The expertise of the specialist to compile a specialist report including a curriculum vitae;	Refer to Appendix 2
b) A declaration that the specialist is independent in a form as may be specified by the competent authority;	Refer to Page ii
c) An indication of the scope of, and the purpose for which the report was prepared;	Refer to Heading 1.1
d) The duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment;	Refer to Heading 3
e) A description of the methodology adopted in preparing the report or carrying out the specialist process inclusive of equipment and modelling used;	Refer to Heading 3
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 infrastructures, inclusive of a site plan identifying site alternatives;	Refer to Headings 4.1, 4.2, 4.3, 4.4, 4.6.
g) An identification of any areas to be avoided, including buffers;	Refer to Figure 8
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;	Refer to Figure 8
i) A description of any assumptions made and any uncertainties or gaps of knowledge;	Refer to Heading 3
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] or activities;	Refer to Heading 6
k) Any mitigation measures for inclusion in the EMPr;	Refer to Heading 7.1
l) Any conditions for inclusion in the environmental authorization;	None
m) Any monitoring requirements for inclusion in the EMPr or environmental authorization;	Refer to Heading 7.1
n) A reasoned opinion -	
(i) [as to] whether the proposed activity, activities or portions thereof should be authorized;	Refer to the “Main conclusion” within the executive summary (Page i)
(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 authorized, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable the closure plan;	Refer to Heading 7.1
o) A description of any consultation process that was undertaken during the course of preparing the specialist report;	N/a
p) A summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	N/a
q) Any information requested by the competent authority.	N/a
2. Where a government notice gazetted 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.	

Curriculum Vitae: Peet JJ Botes

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Nationality: South African

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Language: Afrikaans / English

Profession: Environmental Consultant & Auditing

Specializations: Botanical & Biodiversity Impact Assessments

Environmental Compliance Audits

Environmental Impact Assessment

Environmental Management Systems

Qualifications: **BSc** (Botany & Zoology), with Nature Conservation III & IV as extra subjects; Dept. of Natural Sciences, Stellenbosch University 1989.

Hons. BSc (Plant Ecology), Stellenbosch University, 1989

More than 20 years of experience in the Environmental Management Field (Since 1997 to present).

Professional affiliation: Registered Professional Botanical, Environmental and Ecological Scientist at SACNASP (South African Council for Natural Scientific Professions) since 2005.

SACNAP Reg. No.: 400184/05

BRIEF RESUME OF RELEVANT EXPERIENCE

1997-2005: Employed by the Overberg Test Range (a Division of Denel), responsible for managing the environmental department of OTB, developing and implementing an ISO14001 environmental management system, ensuring environmental compliance, performing environmental risk assessments with regards to missile tests and planning the management of the 26 000 ha of natural veld, working closely with CapeNature (De Hoop Nature Reserve).

2005-2010: Joined Enviroscentific, as an independent environmental consultant specializing in wastewater management, botanical and biodiversity assessments, developing environmental management plans and

strategies, environmental control work as well as doing environmental compliance audits and was also responsible for helping develop the biodiversity part of the Farming for the Future audit system implemented by Woolworths. During his time with Enviroscientific he performed more than 400 biodiversity and environmental legal compliance audits.

2010-2017: Joined EnviroAfrica, as an independent Environmental Assessment Practitioner and Biodiversity Specialist, responsible for Environmental Impact Assessments, Biodiversity & Botanical specialist reports and Environmental Compliance Audits. During this time Mr Botes compiled more than 70 specialist Biodiversity & Botanical impact assessment reports ranging from agricultural-, pipelines- and solar developments.

2017-Present: Establish a small independent consultancy (PB Consult) specialising in Environmental Audits, Biodiversity and Botanical specialist studies as well as Environmental Impact Assessment.

LIST OF MOST RELEVANT BOTANICAL & BIODIVERSITY STUDIES

- Botes, P. 2007: Botanical assessment. Schaapkraal, Erf 644, Mitchell's Plain. A preliminary assessment of the vegetation in terms of the Fynbos Forum: Ecosystem guidelines. 13 November 2007.
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- Botes, P. 2018(g): Steynville (Hopetown) outfall sewer pipeline – Proposed development of a new sewer outfall pipeline, Hopetown, Northern Cape Province. Botanical assessment of the proposed footprint. 8 October 2018.
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ANNEXURE G: GEOTECHNICAL REPORT



GEOTECHNICAL CONDITIONS ON ERVEN 1, 45 AND 47 OF WEGDRAAI: A REPORT FOR THE EXPANSION AND FORMALISATION OF WEGDRAAI COMMUNITY

2020/J09/MCP_01



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EXECUTIVE SUMMARY

1 INTRODUCTION

It is envisaged to develop some 43 hectare of land on Erven 1, 45 and 47 of Wegdraai as an expansion and formalization of the existing Wegdraai community. For this purpose Cedar Land Geotechnical Consult (Pty) Ltd was appointed as sub consultant to Macroplan to conduct a geotechnical investigation on the property.

2 SITE DESCRIPTION

2.1 Site Location

The village of Wegdraai is located some one kilometer to the west of the Orange River and the National Route 10 between Upington and Groblershoop in the Northern Cape. Access to Wegdraai is from Kleinbegin Road. Wegdraai is some 15 km from Groblershoop. The size of the area of investigation is 43 hectare.

2.2 Topography and Drainage

The land investigated is located between 854,0mamsl and 874,0mamsl. Topographical it can be described as generally sloping from west to east in a very low and undulating topography. Drainage takes place by means of surface sheetwash. The sheetwash is disposed of towards the northwest by means of several small non-perennial streams. The drainage courses are contained in narrow, steeply sloping and well defined gullies.

2.3 Vegetation and Landscape

*The area of investigation is referred to as Bushmanland Arid Grassland. The landscape features are described as consisting of extensive to irregular plains on a slightly sloping plateau sparsely vegetated by grassland dominated by white grasses giving this vegetation type the character of semi-desert steppe. On site it was found that in the areas where natural vegetation is present it consists of a sparse stand of *Acacia melliflora* and *prosopis glandula*.*

2.4 Climatic Conditions

The area is located in a summer-rainfall region with mean annual precipitation between 70mm to 200mm ; mean maximum summer temperature of 38°C and mean minimum winter temperature of - 0,6°C. Frost incidence varies between 10 and 35 days per year. The development of whirl winds are

common on hot summer days. The Thornthwaite moisture index is less than -40 ; and the Weinert N value approximately 35. The climate can thus be described as arid.

2.5 Existing Facilities

The area is characterized by the widespread presence of waste material, consisting of domestic waste, stockpiles of gravels and human waste. An excavation to dispose of waste is present in the western part of the site, but it is not used. Numerous trenches, presumably to obtain calcrete gravels for construction, are present in the northern parts of the site.

The area can be divided into two zones as follows :

2.5.1 Informal Housing

Informal housing consisting of galvanized iron structures and some reed structures is present on the perimeter of the existing village. Electricity is provided by overhead power lines. Some residents have created small vegetable and flower gardens on the stands.

2.5.2 Vacant Land

Vacant, undeveloped land extends from the existing village to the limits of the area of investigation in all wind directions.

3 NATURE OF INVESTIGATION

3.1 Test Pitting

On 8 July 2020 31 test pits were excavated with a Bell 315SK TLB on hire from ALS Plant Rentals. The TLB was equipped with a 600mm wide bucket. All test pits were excavated to refusal. The test pits were profiled by a professionally registered geotechnical engineer.

3.2 Materials Testing

Soil testing was undertaken by Roadlab in Upington. Due to general limited vertical extent of the soil profile and coarse nature thereof, it was not feasible to retrieve undisturbed samples to determine properties of settlement or collapse fairly accurately.

Soil testing consisted of the following :

- Conductivity and pH determinations on five samples of the in-situ materials to determine the corrosivity thereof.
- Foundation indicator testing on ten samples of the in-situ materials to determine possible conditions of heave or settlement.
- CBR and road indicator testing on three samples to determine the suitability of the in-situ materials to be utilized as road layerworks.

4 SITE GEOLOGY, SOIL PROFILES AND GEOHYDROLOGY

4.1 Site Geology

The available information shows that the area of investigation is located on a subduction zone dating approximately 1000 million years old. The zone is located between the lithology of the Kaapvaal Craton and the Namaqua-Natal mobile belt. The remains of the original geology in the area are referred to as the Kaaiken Terrane and the site is located on the Groblershoop Formation of the Brulpan Group. The quartz-muscovite schist is described as pale white mottled light green, intensely laminated, closely jointed, soft rock becoming hard rock with depth. While the laminations are generally closed smooth and clean ; the condition of the joints may vary from closed, smooth and clean to open smooth and containing fine, white calcareous sand.

4.2 Soil Profile

4.2.1 Colluvium

On site colluvium as surface deposit was found in all the test pits except TP's 12, 24, 27 and 31. The matrix of the colluvium consists light brown fine sand and clasts of gravels and cobbles of quartz and some calcrete. With an increase in clasts from matrix supported to clast supported the consistency of the colluvium improves from loose to medium dense. The horizon of colluvium was between 100mm and 600mm thick in the test pits.

4.2.2 Mokalanen Formation

4.2.2(i) Hardpan Calcrete

Very dense hardpan calcrete was encountered in TP's 1, 2, 5 to 16, 20, 23 to 29 and 31. It is present dirty white, very fine grained, very dense hardpan calcrete. Small pockets and lenses of red sand may be contained in the pedocretic matrix. The calcrete was present as outcrops in TP's 12, 24, 27 and 31. Elsewhere it underlies the colluvium, occurring from depths between 150mm and 600mm minimum, extending to 200mm to 1000mm maximum.

4.2.2(ii) Boulder Calcrete

Very dense boulder calcrete was encountered in TP's 3, 4, 17, 18 and 30. It is present tightly packets cobbles and boulders up to 500mm in diameter of calcrete in a matrix of light red sand. dirty white, very fine grained, very dense hardpan calcrete. Small pockets and lenses of red sand may be contained in the pedocretic matrix. It underlies the colluvium, occurring from depths between 100mm and 400mm minimum, extending to 300mm to 1000mm maximum.

4.2.3 Residual Quartz-muscovite Schist

Residual quartz-muscovite schist was encountered in TP 19 only. It underlies the colluvium from a depth of 200mm extending to 700mm at which bedrock was encountered. The residual quartz-muscovite schist is described as abundant clast supported, coarse angular gravels of schist in a matrix of dark red brown fine sand. The consistency is dense.

4.3 Groundwater

12.3.1 Perched Water

Perched groundwater was not encountered in any of the test pits excavated for this investigation. It is anticipated that perched water will generally not prove problematic on the site.

12.3.2 Permanent Groundwater

The probability for drilling successfully for water in the area is between 40% and 60%, and the probability that such a borehole will yield more than 2l/s is between 10% and 20%. Groundwater is expected to occur at depths less than 15 meters in compact, argillaceous strata.

5 CONDITIONS OF EXCAVATION

On average over the entire site bedrock or refusal of excavation on very dense hardpan calcrete or quartz-muscovite schist occurred in all the test pits at depths varying between 200mm and 1000mm, averaging 570mm. The implication of this is that should trenches require excavated depths to 1000mm, 43% of the excavation may be classified as hard, requiring drilling and blasting. Should the required depth of excavation increase to 1500mm, 62% of the excavation may be classified as hard.

6 SITE CLASS DESIGNATION

The land can be divided into three geotechnical zones as follows :

6.1 Geotechnical Zone I

The zone is classed as R, meaning that the proposed horizon for founding is stable and negligible soil movement is expected. The distribution thereof encompasses 95% of the proposed area for development. Slope across the land is less than 2%. Two foundation design alternatives are applicable to the zone, namely conventional strip foundations or slab-on-the-ground foundations placed directly on bedrock or very dense pedocrete.

6.2 Geotechnical Zone II

The zone is classed as S, meaning that the proposed horizon for founding is slightly compressible and rapid settlement less than 10mm is expected. The distribution thereof encompasses 2% of the proposed area for development. Slope across the land is less than 2%. Two foundation design alternatives are applicable to the zone, namely conventional strip foundations or slab-on-the-ground foundations placed directly on medium dense terrace gravels.

6.3 Geotechnical Zone III

The zone is classed as S, meaning that the proposed horizon for founding is slightly compressible and rapid settlement less than 10mm is expected. The distribution thereof encompasses 3% of the proposed area for development. Slope across the land is between 2% and 6%. Two foundation design alternatives are applicable to the zone, namely conventional strip foundations or slab-on-the-ground foundations placed directly on medium dense terrace gravels. The more viable foundation alternative therefore remains founding by conventional strip foundations.

7 LAND SLOPE

The average slope across the larger part of the land is less than 2%. Only in Geotechnical Zones III does the slope exceed 2%, that is over 3% of the site. This slope of less than 2% has a detrimental influence on especially the design of a stormwater disposal system depending on gravity to dissipate of the surface water due to downpours. The land slope also affects the design of the sewerage disposal but to a lesser extent as the gradient of the pipes can be adjusted according to design requirements.

8 AREAS SUBJECT TO FLOODING

The non-perennial water courses on site are contained in well-defined, narrow gullies and may be regarded as being of lesser importance, requiring no additional precautionary measures to ensure the safety of the population against flooding.

9 MATERIALS UTILIZATION

- *Trench Backfilling : None of the materials are suitable for selected fill or pipe bedding. With exception of the hardpan calcrete all materials can be used for normal backfill.*
- *Layerworks for Paved or Segmental Block Paving : The residual soils are suitable for the construction of subbase and base course construction for lightly trafficked roads.*
- *Wearing Course for Gravel Roads in Urban Areas : None of the soil materials are 100% suitable for this purpose, but calcrete is the most suitable present. The use of these materials will generally result in a road surface subject to raveling and corrugations.*

10 OTHER CONSIDERATIONS

- *Undermining : The area is not subject to undermining.*
- *Seismic Activity : The Peak Ground Acceleration expected in 50 years is 0,06g. A low risk for the development of earth tremors therefore exist.*
- *Soil Corrosivity : The in-situ soils and pedocretes are not corrosive due to acidic properties, but corrosive due to high soluble salts contents.*
- *Dolomite : The area of investigation is not subject to any restrictions due to the presence of dolomite. Bedrock of dolomite does not occur in the area of investigation.*

GEOTECHNICAL CONDITIONS ON ERVEN 1, 45 AND 47 OF WEGDRAAI: A REPORT FOR THE EXPANSION AND FORMALISATION OF WEGDRAAI COMMUNITY

2020/J09/MCP_01

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GEOTECHNICAL CONDITIONS ON ERVEN 1, 45 AND 47 OF WEGDRAAI : A REPORT FOR THE EXPANSION AND FORMALISATION OF WEGDRAAI COMMUNITY

1 INTRODUCTION

It is envisaged to develop some 43 hectare of land on Erven 1, 45 and 47 of Wegdraai as an expansion and formalization of the existing Wegdraai community. For this purpose Cedar Land Geotechnical Consult (Pty) Ltd was appointed as sub consultant to Macroplan as per the minutes of the start-up meeting of the project held in the offices of Macroplan on 20 May 2020 to conduct a geotechnical investigation on the property.

2 TERMS OF REFERENCE

The requirements of the following documents were adhered to in the conduct of the investigation and reporting of the project :

- The document *Geotechnical Site Investigations for Housing Developments (Generic Specification GFSH-2)*, issued by the National Department of Housing in September 2002.
- The document *SANS 634-1 : Geotechnical Investigations for Township Development*, issued by SABS in February 2012.

3 AVAILABLE INFORMATION

The following source of available information recording available data obtained in the larger Upington to Groblershoop area have been consulted for background information :

- *Breytenbach FJ* : Contract NRA N010-110-2012/1F : Geotechnical Investigation for Four

Directors : FJ Breytenbach (Pr Eng) B Eng (Civ) NDT (Geology); M Breytenbach M Sc (Mathematical Statistics)

Bridge Widenings on the National Route 10 Section 11 between Groblershoop (km 0,0) and Lambrechtsdrift (km 61,1), issued by Soilkraft cc on behalf of Bvi Engineers on 8 March 2012.

4 SITE DESCRIPTION

4.1 Site Location

The village of Wegdraai is located some one kilometer to the west of the Orange River and the National Route 10 between Upington and Groblershoop in the Northern Cape. Access to Wegdraai is from Kleinbegin Road. Wegdraai is some 15 km from Groblershoop. The area of investigation consisting of Erven 1, 45 and 47 Wegdraai, is located on the perimeter of the village, on the northern, western, eastern and southern sides thereof. The size of the area of investigation is 43 hectare.

Refer to the attached Figure 1 : Locality Plan.

4.2 Topography and Drainage

The land investigated is located between 854,0mamsl and 874,0mamsl. Topographical it can be described as generally sloping from west to east in a very low and undulating topography.

Drainage takes place by means of surface sheetwash. The sheetwash is disposed of towards the northwest by means of several small non-perennial streams. The drainage courses are contained in narrow, steeply sloping and well defined gullies.

4.3 Vegetation and Landscape

Based on the work done by Mucina^{Reference 14.1} the area of investigation is referred to as Bushmanland Arid Grassland. The landscape features are described as consisting of extensive to irregular plains on a slightly sloping plateau sparsely vegetated by grassland dominated by white grasses giving this vegetation type the character of semi-desert steppe. In places low shrubs change the vegetation structure. In years of abundant rainfall rich displays of annual herbs can be expected. On site it was found that in the areas where natural vegetation is present it consists of a sparse stand of *Acacia melliflora* and *prosopis glandula*.

4.4 Climatic Conditions

The area is located in a summer-rainfall region with mean annual precipitation between 70mm

to 200mm ; mean maximum summer temperature of 38°C and mean minimum winter temperature of -0,6°C. Frost incidence varies between 10 and 35 days per year. The development of whirl winds are common on hot summer days. The Thornthwaithe moisture index is less than -40 ; and the Weinert N value approximately 35. The climate can thus be described as arid. The importance of this is that mechanical breakdown of bedrock will take place rather than chemical decomposition, limiting the formation of secondary minerals such as expansive montmorillonite clay.

4.5 Existing Facilities

Site conditions are illustrated on Photo 1 : Site Conditions. The area is characterized by the widespread presence of waste material, consisting of domestic waste, stockpiles of gravels and human waste. An excavation to dispose of waste is present in the western part of the site, but it is not used. Numerous trenches, presumably to obtain calcrete gravels for construction, are present in the northern parts of the site.

The area can be divided into two zones as follows :

4.5.1 Informal Housing

Informal housing consisting of galvanized iron structures and some reed structures is present on the perimeter of the existing village. Electricity is provided by overhead power lines. Some residents have created small vegetable and flower gardens on the stands.

4.5.2 Vacant Land

Vacant, undeveloped land extends from the existing village to the limits of the area of investigation in all wind directions.

5 NATURE OF INVESTIGATION

5.1 Test Pitting

In compliance with the requirements of SANS 634 and GFSH-2 test pitting was conducted to provide applicable geotechnical information. On 8 July 2020 31 test pits were excavated with a Bell 315SK TLB on hire from ALS Plant Rentals. The TLB was equipped with a 600mm wide bucket. All test pits were excavated to refusal.



HOUSEHOLD WASTE IN THE VILLAGE



UNUSED EXCAVATION FOR WASTE DISPOSAL



CONDITIONS IN THE VILLAGE



COLLUVIAL DEPOSITS OF COARSE GRAVELS AND COBBLES



ABANDONED TRENCH EXCAVATIONS



QUARTZ-MUSCOVITE SCHIST OUTCROPS THROUGH SURFACE CALCRETE



The test pits were profiled by a professionally registered geotechnical engineer. For the benefit of the non-geotechnical reader of this document, the guidelines for test pit profiling are summarized in the attached Table 1 : Soil Profiling Parameters. The profiles of the test pits may be found in Addendum A to this report. The positions of the test pits are indicated on the attached Figure 2 : Site Plan. Provisional co-ordinates for property beacons A to AAV are indicated on this figure. Due to access restrictions TP 15 had to be relocated from its original position.

TABLE 1 : SOIL PROFILING PARAMETERS

CONSISTENCY : GRANULAR SOILS				CONSISTENCY : COHESIVE SOILS			
SPT N		GRAVELS & SANDS Generally free draining soils	DRY DENSITY (kg/m ³)	SPT N		SILTS & CLAYS and combinations with SANDS Generally slow draining soils	UCS (kPa)
<4	Very loose	Crumbles very easily when scraped with geological pick. Requires power tools for	<1450	<2	Very soft	Pick point easily pushed in 100mm. Easily moulded by fingers.	<50
4-10	Loose	Small resistance to penetration by sharp pick point. requires many blows by pick point	1450- 1600	2-4	Soft	Pick point easily pushed in 30mm to 40mm. Moulded by fingers with some pressure.	50- 125
10- 30	Medium dense	Considerable resistance to penetration by sharp pick point.	1600- 1750	4- 8	Firm	Pick point penetrates to 10mm. Very difficult to mould with fingers.	125- 250
30- 50	Dense	Very high resistance to penetration by sharp pick point. Requires many blows by pick point for excavation.	1750- 1925	8- 15	Stiff	Slight indentation by pick point. Cannot be moulded by fingers. Penetrated by thumb nail.	250- 500
>50	Very dense	High resistance to repeated blows of geological pick. Requires power tools for excavation.	>1925	15- 30	Very stiff	Slight indentation by blow of pick point. Requires power tools for excavation.	500- 1000

SOIL TYPE

SOIL TYPE	PARTICLE SIZE(mm)
Clay	<0,002
Silt	0,002-0,06
Sand	0,06-2,0
Gravel	2,0-60,0
Cobbles	60,0-200,0
Boulders	>200,0

MOISTURE CONDITION

Dry	No water detectable
Slightly moist	Water just discernable
Moist	Water easily discernable
Very moist	Water can be squeezed out
Wet	Generally below water table

SOIL STRUCTURE

COLOUR		Intact	No structure present
Speckled	Very small patches of colour <2mm	Fissured	Presence of discontinuities, possibly cemented.
Mottled	Irregular patches of colour 2-6mm	Slickensided	Very smooth, glossy, often striated discontinuity planes.
Blotched	Large irregular patches 6-20mm	Shattered	Presence of open fissures. Soil break into gravel size blocks.
Banded	Approximately parallel bands of varying colours	Micro shattered	Small scale shattering, very closely spaced open fissures. Soil breaks into sand size crumbs.
Streaked	Randomly orientated streaks of colour	Residual structures	Residual bedding, laminations, foliations etc.
Stained	Local colour variations : Associated with discontinuity surfaces		

ORIGIN

Transported	Alluvium, hillwash, talus etc.
Residual	Weathered from parent rock, eg residual granite
Pedocretes	Femcrete, sicrete, calcicrete etc.

DEGREE OF CEMENTATION OF PEDOCRETES

TERM	DESCRIPTION	UCS (MPa)
Very weakly cemented	Some material can be crumbled between finger and thumb. Disintegrates under knife blade to a friable state.	0,1-0,5
Weakly cemented	Cannot be crumbled between strong fingers. Some material can be crumbled by strong pressure between thumb and hard surface. Under light hammer blows disintegrate to a friable state.	0,5-2,0
Cemented	Material crumbles under firm blows of sharp pick point. Grains can be dislodged with some difficulty by a knife blade.	2,0-5,0
Strongly cemented	Firm blows of sharp pick point on hand-held specimen show 1-3mm indentations. Grains cannot be dislodged by knife blade.	5,0- 10,0
Very strongly cemented	Hand-held specimen can be broken by single firm blow of hammer head. Similar appearance to concrete.	10,0- 25

5.2 Materials Testing

Soil testing was undertaken by Roadlab in Upington. As a matter of quality control duplicate samples were sent to the Roadlab branch in Germiston for independent testing to verify the

COORDINATES – WEGDRAAI		
System: WGS84 GW21		
Point	Y	X
A	-83356.574	3191885.920
B	-83710.756	3191707.939
C	-83829.565	3191648.200
D	-83869.135	3191726.896
E	-83766.620	3191778.407
F	-83782.023	3191808.905
G	-83739.575	3191830.393
H	-83725.876	3191804.344
J	-83727.722	3191797.724
K	-83709.102	3191793.821
L	-83752.919	3191877.774
M	-83784.106	3191924.927
N	-83861.307	3192073.792
P	-83954.417	3192021.694
Q	-83968.536	3192004.443
R	-84063.620	3192082.321
S	-83537.415	3192328.712
T	-83851.920	3191637.014
U	-84211.636	3191459.865
V	-84495.144	3191378.309
W	-84515.878	3191450.386
X	-84302.587	3191511.633
Y	-84359.863	3191621.660
Z	-84248.849	3191696.523
AA	-84200.542	3191722.795
AB	-84113.821	3191550.176
AC	-83869.872	3191672.746
AD	-84760.348	3191302.036
AE	-84888.943	3191265.051

COORDINATES – WEGDRAAI		
System: WGS84 GW21		
Point	Y	X
AF	-84907.86	3191332.900
AG	-84856.320	3191373.470
AH	-84817.720	3191424.300
AJ	-84802.700	3191438.360
AK	-84780.129	3191450.378
AL	-84764.094	3191394.636
AM	-84785.234	3191388.556
AN	-84926.312	3191405.270
AP	-85024.260	3191357.460
AQ	-85094.530	3191387.840
AR	-85138.760	3191529.800
AS	-85185.448	3191623.605
AT	-85097.897	3191676.211
AU	-85136.859	3191740.863
AV	-84461.030	3191930.970
AW	-84429.829	3191876.815
AX	-84337.196	3191789.409
AY	-84454.154	3191714.674
AZ	-84578.665	3191671.094
AAA	-84612.347	3191625.046
AAB	-84619.276	3191624.041
AAC	-84709.262	3191692.636
AAD	-84690.473	3191717.284

COORDINATES – WEGDRAAI		
System: WGS84 GW21		
Point	Y	X
AAE	-84734.454	3191751.330
AAF	-84779.296	3191709.328
AAG	-84824.088	3191759.597
AAH	-84850.808	3191736.913
AAJ	-84843.054	3191727.766
AAK	-84952.248	3191647.497
AAL	-84973.750	3191634.408
AAM	-85054.034	3191585.536
AAN	-85035.876	3191555.832
AAP	-85053.963	3191543.349
AAQ	-85071.601	3191561.284
AAR	-85092.317	3191545.192
AAS	-85078.470	3191528.069
AAT	-85066.777	3191534.423
AAU	-85048.196	3191513.779
AAV	-85024.931	3191538.369

Adapted from Project : Wegdraai, Dated June 2020.
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FIGURE 2 :
SITE PLAN

LEGEND	
	TP1 TEST PIT POSITION
	RUBBLE
	WASTE DISPOSAL SITE
	TRENCHES



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TASK: Expansion and Formalisation
 of Wegdraai Community
 JOB NAME: Erven 1, 45 and 47
 of Wegdraai
 CLIENT: IKheis Municipality
 DRAWING NO: Figure 2 : Site Plan
 DATE: 10 September 2020

results. Due to general limited vertical extent of the soil profile and coarse nature thereof, it was not feasible to retrieve undisturbed samples to determine properties of settlement or collapse fairly accurately.

Soil testing consisted of the following :

- Conductivity and pH determinations on five samples of the in-situ materials to determine the corrosivity thereof.
- Foundation indicator testing on ten samples of the in-situ materials to determine possible conditions of heave or settlement.
- CBR and road indicator testing on three samples to determine the suitability of the in-situ materials to be utilized as road layerworks.

The results of the soil testing may be found in Addendum B. However, for easy reference, these results are summarized in the attached Table 2 : Summary of Soil Testing. The data sheets contained in Addendum B are copies of the originals, which are available from Roadlab.

6 SITE GEOLOGY AND GEOHYDROLOGY

The geology of the area between Upington and Groblershoop appears to consist of granitoid rock in the north, grading into metamorphic rocks towards Groblershoop, but it is in fact highly complex and from a stratigraphical viewpoint provides complicated formation. As a background to the site geology an effort is made in this subparagraph to provide a simplified explanation of the regional geology of the area. For this purpose publications by McCarthy^{Reference 14.2}, Cornell^{Reference 14.3} and Moen^{Reference 14.4} were consulted. Of these three references, the latter two can be regarded as site specific. However, there is disagreement between the two sources regarding the stratigraphic classification of the major subdivisions of the Namaqua-Natal province. As the work produced by Cornell is regarded as the reference document, his approach is adopted for this report.

Some concepts must be identified :

- *Craton* : A craton is a block of ancient crust, formed 3000 million years ago and its rocks have essentially remained unchanged. Cratons form the larger parts of the land-building mass.
- *Province* : A tectono-stratigraphic province is defined as a large area of contiguous structural fabric with well-defined boundaries which formed during a particular, geochronologically defined, tectono-metamorphic event. A province is further subdivided in sub-provinces and sub-provinces into terranes.

TABLE 2 : SUMMARY OF SOIL TESTING

TEST PIT NO	SAMPLE NO (CLG)	DEPTH (mm)	SOIL ORIGIN	SOIL TYPE	GM	PI	LL	ACTIVITY	pH	CONDUCTIVITY ($S m^{-1}$)	% < 0,002mm	OMC	MOD	SOIL CLASS		
														COLTO	PRA	UNIFIED
TP 1	U9267	0-300	Colluvium	Sandy gravel	1,90	1,0	14	Low			1,7				A-1-b(0)	SC
TP 6	U9268	0-400	Hardpan calcrete	Sandy gravel	2,00	2,0	17	Low	7,64	0,13	0,5				A-1-b(0)	GC
TP 12	U9269	400-800	Hardpan calcrete	Sandy gravel	2,10	2,0	21	Low			0,7	10,5	1922	G5	A-1-b(0)	SC
TP 16	U9270	0-300	Colluvium	Sandy gravel	2,00	2,0	21	Low	7,80	0,09	1,0				A-1-b(0)	GC
TP 17	U9271	500-500	Bedrock schist	Rock fragments	2,20	7,0	33	Low			0,7	9,2	1932	G6	A-2-4(0)	GW-GM
TP 21	U9272	0-400	Colluvium	Sandy gravel	2,10	3,0	18	Low	7,75	0,10	1,3				A-1-b(0)	GC
TP 23	U9273	100-400	Hardpan calcrete	Sandy gravel	2,10	8,0	27	Low	7,87	0,09	1,1				A-2-4(0)	GC
TP 26	U9274	200-600	Hardpan calcrete	Sandy gravel	2,10	2,0	19	Low			0,5				A-1-b(0)	SW-SC
TP 30	U9275	200-1000	Boulder calcrete	Sandy gravel	2,30	7,0	24	Low			1,1	7,5	2153	G6	A-2-4(0)	GW-GM-GC
TP 31	U9276	0-300	Hardpan calcrete	Sandy gravel	1,90	8,0	27	Low	7,81	0,07	1,6				A-2-4(0)	GC

- *Terrane* : A terrane is a term for a tectonostratigraphic unit, which is a fragment of crustal material formed on, or broken off from, one tectonic plate and accreted or "sutured" to crust lying on another plate. The crustal block or fragment preserves its own distinctive geologic history, which is different from that of the surrounding areas.

6.1 Regional Geology

The geological processes by which the area under consideration was shaped, initiated some 1000 million years ago with the formation of the supercontinent Rodinia. A mountain chain of global extent formed along the boundaries, underlain by metamorphic rocks that have since then been exposed due to erosion. Metamorphic rocks of this age formed across South Africa to the south and west of the Kaapvaal Craton, known as the Namaqua-Natal Province. The Namaqua-Natal Province can be divided into five tectonostratigraphic subprovinces and terranes, based on marked changes in the lithostratigraphy across structural discontinuities. The five domains so recognized are the Richtersveld Subprovince, the Bushmanland Terrane, Kakamas Terrane, Areachap Terrane and Kaaiken Terrane. The tectonic subdivision as proposed on Figure 2 (Cornell) is reproduced in this document as Figure 3.

The process of landforming can be described as compatible to the modern concept of plate tectonics. In this case the Namaqua plate became buried beneath the Kaapvaal Craton in a subduction zone. Considering the forces involved it can be regarded as a violent process, resulting in the breaking up of the landmass into the five domains as described above, associated with the intrusion of recycled rock material from the subduction zone. What is important for this report is that in the case of the Kaaiken terrane, the formation of metaquartzites, deformed early Namaquan volcano-sedimentary rocks and deformed, but thermally metamorphosed bimodal volcanic rocks resulted, amongst others. These rocks are at present referred to amongst others as the Groblershoop Formation Brulpan Group, on which Wegdraai is located. There is controversy about the age of the Brulpan Group, but is estimated between 1710Ma to 1780Ma, underlying the Wilgenhoutsdrif Group.

The regional geology is indicated on Figure 4 : Regional Geology.

6.2 Site Geology

The site geology is illustrated on Figure 5. The soil, but especially the pedocretes form an ubiquitous and well developed cover over bedrock with only localized exposures in areas of thin and less dense pedocretic cover, thus hampering field investigations. The inferred material boundaries must be accepted as indicative of the actual conditions only.

Bedrock on site occurs as quartz-muscovite schist of the Groblershoop Formation, Brulpan Group. The strata of the Groblershoop Formation are intensely foliated on site, dipping between zero and 45°, striking randomly. On site the quartz-muscovite schist was exposed in TP's 17 to 19, 21 and 22, but elsewhere covered by a very dense horizon of hardpan calcrete. The quartz-muscovite schist is described as pale white mottled light green, intensely laminated, closely jointed, soft rock becoming hard rock with depth. While the laminations are generally closed smooth and clean ; the condition of the joints may vary from closed, smooth and clean to open smooth and containing fine, white calcareous sand.

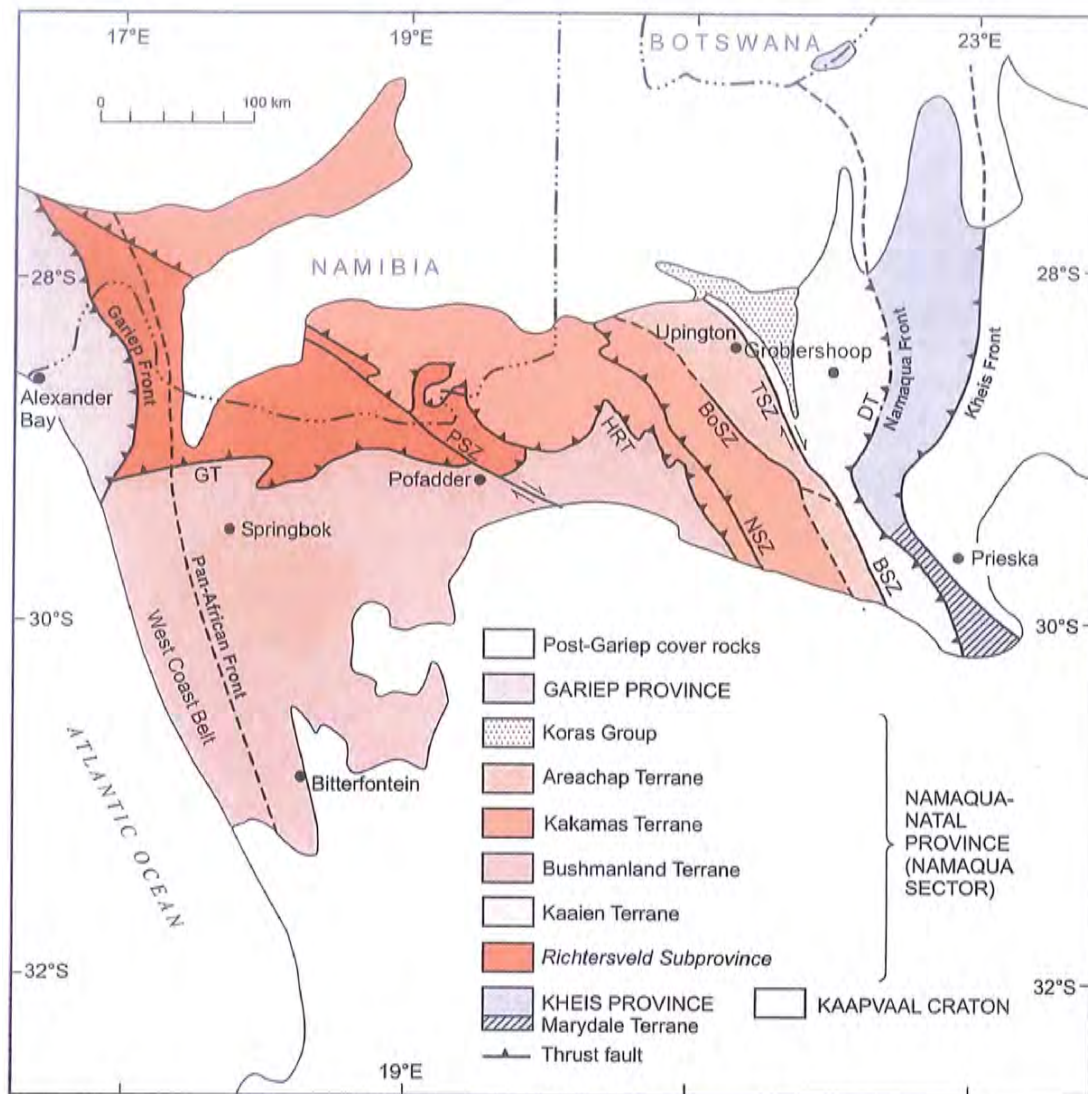


FIGURE 3 : TECTONIC SUBDIVISION OF THE NAMAQUA SECTOR

6.3 Soil Profile

6.3.1 Colluvium

Although the surface soil deposits may easily be regarded as alluvial sands transported by the



FIGURE 4

Adapted from Project : Topline, Dated June 2020.
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FIGURE 5 :
SITE GEOLOGY

- LEGEND
- TP1 TEST PIT POSITION
 - RUBBLE
 - WASTE DISPOSAL SITE
 - TRENCHES
 - INFERRED MATERIAL BOUNDARY



Lithology	Formation	Group
C	Calcrete	Mokolanen
G	Quartz-muscovite schist	Groblershoop
		Kalahari
		Bulpan

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of Wegdraai Community
JOB NAME:
LIGGING: Erven 1, 45 and 47
of Wegdraai
SITE:
KLIENT: !Kheis Municipality
CLIENT:
TEKENING NO: Figure 5 : Site Geology
DRAWING NO:
DATUM: 10 September 2020
DATE:

Orange River, this is not the case. Moen (Reference 14.4 page 149) describes the presence of alluvium and terrace gravels associated with the Orange River as being present on the northeastern banks of the river in the area between Grootdrink and Groblershoop.

On site colluvium as surface deposit was found in all the test pits except TP's 12, 24, 27 and 31. The colluvium is not a homogenous material on site due to a variable gravel content thereof. The matrix of the colluvium consists light brown fine sand and clasts of gravels and cobbles of quartz and some calcrete. With an increase in clasts from matrix supported to clast supported the consistency of the colluvium improves from loose to medium dense. The matrix of the colluvium remains intact throughout. The horizon of colluvium was between 100mm and 600mm thick in the test pits.

6.3.3 Mokalanen Formation

Calcrete of the Mokalanen Formation, Kalahari Group, is present as an ubiquitous surface duricrust on site. Again there is a difference in opinion between Moen (Reference 14.4 page 147) and Partridge^{Reference 14.5} regarding the origin of the calcrete. Moen regards the calcrete as being of Tertiary age, but some doubt exists whether the outcrops are of the same age and in some localities it may still be in the process of forming. Partridge describes the age of the calcrete as straddling the boundary between the Pliocene and Quaternary, making it some 2,6 to 2,8 million years old. It was deposited under arid conditions and possibly reflects a climatic interval of global aridification.

The engineering properties of calcrete may differ widely for samples taken from the same locality. It is therefore important to provide some background in this regard to aid in the understanding of these conditions.

Brink^{Reference 14.6} states that during pedocrete development, clay and silt become flocculated and cemented into larger silt to gravel-sized complexes of varying strength and porosity. These particles and aggregations may or may not break down during laboratory testing and under compaction. The mineralogy of the cementing material and of the clay fraction is different from those of normal, temperate zone soils on which current specifications for soil testing and classification is based. Calcrete can therefore be expected to exhibit differences in behaviour from those of traditional soil materials.

Whereas in traditional soil mechanics it is assumed that all the water is outside the particles, calcrete aggregates retain moisture and this affects conventional moisture content and Atterberg limit determinations. Palygorskite which is the dominant clay in calcrete has approximately the same plasticity index as some smectites, which can be regarded as highly expansive. However, the palygorskite has a non-expansive lattice and a hollow, needle-like

shape instead of the usual flaky particle shape of most other clays. It has the lowest shrinkage limit and dry density and the highest optimum moisture content and shear strength of all clays.

Be it as it may, calcrete was encountered as the dominant lithic material on site, in virtually a continuous cover over the quartz-muscovite schist, with the schist outcropping occasionally only in limited areas of localized extent. Moen reports the calcrete to be up to five meters thick in the area.

The calcrete is present as follows :

6.3.3(i) Hardpan Calcrete

Very dense hardpan calcrete was encountered in TP's 1, 2, 5 to 16, 20, 23 to 29 and 31. It is present as dirty white, very fine grained, very dense hardpan calcrete. Small pockets and lenses of red sand may be contained in the pedocretic matrix. The calcrete was present as outcrops in TP's 12, 24, 27 and 31. Elsewhere it underlies the colluvium, occurring from depths between 150mm and 600mm minimum, extending to 200mm to 1000mm maximum, at which stage refusal of excavation occurred or bedrock of quartz-muscovite schist was encountered.

6.3.3(ii) Boulder Calcrete

Very dense boulder calcrete was encountered in TP's 3, 4, 17, 18 and 30. It is present tightly packed cobbles and boulders up to 500mm in diameter of calcrete in a matrix of light red sand. Small pockets and lenses of red sand may be contained in the pedocretic matrix. It underlies the colluvium, occurring from depths between 100mm and 400mm minimum, extending to 300mm to 1000mm maximum, at which stage refusal of excavation occurred or bedrock of quartz-muscovite schist was encountered.

6.3.4 Residual Quartz-muscovite Schist

Residual quartz-muscovite schist was encountered in TP 19 only. It underlies the colluvium from a depth of 200mm extending to 700mm at which bedrock was encountered. The residual quartz-muscovite schist is described as abundant clast supported, coarse angular gravels of schist in a matrix of dark red brown fine sand. The consistency is dense.

6.3.5 Fill

Areas of stockpiled material were encountered randomly across the site, but especially to the

west of the existing village. The most important of these stockpiles of waste are indicated on the site plans and illustrated on the photo sheet. However, large areas of the land was littered with waste consisting of quartz gravels, soil, all types of household waste and builders' rubble. Test pit 14 was excavated through such waste. The waste can be described as consisting of dry, light brown sand containing ash, paper, bones, glass, plastic and decaying household matter. The waste extended to a depth of 300mm in the test pit, prior to encountering colluvium.

6.4 Groundwater

6.4.1 Perched Water

Perched groundwater was not encountered in any of the test pits excavated for this investigation. Considering the climate of the area and the nature of in situ materials, it is anticipated that perched water will generally not prove problematic on the site, except in the lesser drainage courses of the site after events of inundation. Even if it did occur, the grading of in-situ materials is such that dispersal will take place fairly rapidly. Furthermore, it is expected that perched water and/or surface seepage may occur shortly after precipitation events and in years of excessive rain only.

6.4.2 Permanent Groundwater

Vegter^{Reference 14.7} indicates the probability for drilling successfully for water in the area to be between 40% and 60%, and the probability that such a borehole will yield more than 2l/s is between 10% and 20%. Groundwater is expected to occur at depths less than 15 meters in compact, argillaceous strata.

7 GEOTECHNICAL EVALUATION

The engineering properties of the in-situ materials are summarized in Table 3 : Summary of Engineering Properties. The characterizations have been derived based on the Unified materials classifications as reported by literature studies.

7.1 Engineering and Material Characteristics

7.1.1 Properties of Heave

The results of the materials testing as reported in Table 2 indicate the in-situ materials are not expansive. Any future structures will thus not be subject to heave. The content of active clay,

TABLE 3 : SUMMARY OF ENGINEERING PROPERTIES

TEST PIT NO	SAMPLE NO	DEPTH (mm)	SOIL ORIGIN	SOIL TYPE	SOIL CLASS		COHESION ¹ (kNm ⁻²)	FRICTION ANGLE (°) ¹	COMPRESSIBILITY ²	EROSION RESISTANCE ²⁺⁵	PERMEABILITY ² k (cms ⁻¹)	SPECIFICATIONS FOR UNPAVED ROADS ³					SUITABILITY FOR ROAD CONSTRUCTION ⁴	
					PRA	UNIFIED						MAXIMUM SIZE	OVERSIZE INDEX (I _s)	GRADING COEFFICIENT (G _c)	SHRINKAGE PRODUCT (S _p)	CBR @ 95% MOD	PAVED	UNPAVED
TP 1	U9267	0-300	Colluvium	Sandy gravel	A-1-b(0)	SC	5 to 10	30° to 35°	Low	5	(3±2)X10 ⁻⁷	28,0	0	24,8	20,0			Ravels & corrugates
TP 6	U9268	0-400	Hardpan calcrete	Sandy gravel	A-1-b(0)	GC	<5	28° to 35°	Very low	3	>3X10 ⁻⁷	37,5	7	17,9	39,0			Ravels & corrugates
TP 12	U9269	400-800	Hardpan calcrete	Sandy gravel	A-1-b(0)	SC	5 to 10	30° to 35°	Low	5	(3±2)X10 ⁻⁷	50,0	4	20,3	55,5	64	Base & subbase	Ravels & corrugates
TP 16	U9270	0-300	Colluvium	Sandy gravel	A-1-b(0)	GC	<5	28° to 35°	Very low	3	>3X10 ⁻⁷	28,0	0	20,7	41,0			Ravels & corrugates
TP 17	U9271	500-900	Bedrock schist	Rock fragments	A-2-4(0)	GW-GM	<5	30° to 40°	Negligible	1 to 4	(2,7±1,3)X10 ⁻²	63,0	7	19,3	70,0	22	Subbase	Ravels & corrugates
TP 21	U9272	0-400	Colluvium	Sandy gravel	A-1-b(0)	GC	<5	28° to 35°	Very low	3	>3X10 ⁻⁷	37,5	4	22,1	68,0			Ravels & corrugates
TP 23	U9273	100-400	Hardpan calcrete	Sandy gravel	A-2-4(0)	GC	<5	28° to 35°	Very low	3	>3X10 ⁻⁷	50,0	15	14,3	119,0			Erodible
TP 26	U9274	200-600	Hardpan calcrete	Sandy gravel	A-1-b(0)	SW-SC	1 to 10	30° to 38°	Negligible to low	5 to 6	(3±2)X10 ⁻⁷	50,0	4	21,7	37,0			Ravels & corrugates
TP 30	U9275	200-1000	Boulder calcrete	Sandy gravel	A-2-4(0)	GW-GM-GC	<5	28° to 40°	Negligible to very low	3 to 4	2,7X10 ⁻⁶ to 5X10 ⁻⁷	63,0	13	15,6	67,5	35	Subbase	Ravels & corrugates
TP 31	U9276	0-300	Hardpan calcrete	Sandy gravel	A-2-4(0)	GC	<5	28° to 35°	Very low	3	>3X10 ⁻⁷	50,0	6	16,7	154,0			Good

1 Obrzud RF and Truty A : The Hardening Soil Model - A Practical Guidebook, 2018 edition, revised 21 October 2018.

2 Brink ABA et al : Soil Survey for Engineering, published in 1982.

3 The Structural Design, Construction and Maintenance of Unpaved Roads (Draft TRH 20), Committee of State Road Authorities 1990.

4 Structural Design of Flexible Pavements for Interurban and Rural Roads (Draft TRH 4), Committee of State Road Authorities 1996.

5 Erosion resistance : 1 is best 10 is poor.

that is the material smaller than 0,002mm in diameter, was less than 2% for all the samples tested.

7.1.2 Properties of Settlement

7.1.2(i) *Colluvium*

On site colluvium as surface deposit was found in all the test pits except TP's 12, 24, 27 and 31. The colluvium is not a homogenous material on site due to a variable gravel content. The matrix of the colluvium consists light brown fine sand and clasts of gravels and cobbles of quartz and some calcrete. With an increase in clasts from matrix supported to clast supported the consistency of the colluvium improves from loose to medium dense. The horizon of colluvium was between 100mm and 600mm thick in the test pits. The consistency cannot be described as very loose, and voided soil matrices were not encountered in the colluvial horizons. The properties of the colluvium are thus such that it does not tend to excessive settlement.

7.1.2(ii) *Residual Quartz-muscovite Schist*

Residual quartz-muscovite schist was encountered in TP 19 only. It underlies the colluvium from a depth of 200mm extending to 700mm at which bedrock was encountered. The residual quartz-muscovite schist is described as abundant clast supported, coarse angular gravels of schist in a matrix of dark red brown fine sand. The consistency is dense. It can thus accommodate stresses imposed by conventional housing structures without undue settlement. Only limited – if any – settlement can thus be expected for structures such as single storey units of masonry construction.

7.1.2(iii) *Pedocretes*

Very dense hardpan calcrete underlying the colluvium was encountered in TP's 1, 2, 5 to 16, 20, 23 to 29 and 31. The calcrete was present as outcrops in TP's 12, 24, 27 and 31. It is present as dirty white, very fine grained, very dense hardpan calcrete. Small pockets and lenses of red sand may be contained in the pedocretic matrix. It occurs to depths of 150mm and 600mm minimum, extending to 200mm to 1000mm maximum, at which stage refusal of excavation occurred or bedrock of quartz-muscovite schist was encountered. Both materials are of very dense consistency. It can thus accommodate stresses imposed by conventional housing structures without undue settlement. Only limited – if any – settlement can thus be expected for structures such as single storey units of masonry construction.

7.1.3 Corrosivity

When discussing soil corrosivity, it is applicable to consider the guidelines as proposed by Evans^{Reference 14.8}. The corrosivity of a soil towards buried, exposed, metallic surfaces is dependent on the following properties of the soil :

- Electrical conductivity.
- Chemical properties of the soil.
- Ability of the soil to support sulphate reducing bacteria.
- Heterogeneity of the soil.

The tests carried out for the compilation of this report must be considered as indicative of the corrosivity of the soils only. The pH of a soil gives an indication of potential acid related problems. Should the soil pH be less than 6,0, corrosion may take place ; and should the pH be less than 4,50, the problem of corrosion may be serious. If the conductivity of the soil is less than $0,01\text{Sm}^{-1}$, corrosiveness is generally not a problem. However, the potential for corrosivity of the soil increases with an increase in conductivity. Should the conductivity of the soil exceed $0,05\text{Sm}^{-1}$, the soil can be regarded as very corrosive. Should exposed metal pipes pass from argillaceous soils to arenaceous soils or vice versa, electrochemical cells are set up due to the different rates of oxygen diffusion of the soils. Sulphate reducing bacteria is usually present under anaerobic conditions, that is, typically saturated or waterlogged clays.

The results of the chemical testing carried out for this report indicate the following :

- *Acidity* : The pH of the samples of material tested varied between 7,6 and 8,9. The soils are thus regarded as not corrosive due to the acidity there of.
- *Water Soluble Salts Content* : The conductivity of the samples of material tested varied between $0,07\text{Sm}^{-1}$ to $0,13\text{Sm}^{-1}$ for the calcrete ; and between $0,09\text{Sm}^{-1}$ to $0,10\text{Sm}^{-1}$ for the colluvium. The high soluble salt content does therefore results in all materials to be corrosive.

Other considerations are :

- *Heterogeneity of the Soil* : Conditions of corrosive soils due to a heterogeneous soil profile do not occur on the property.
- *Water Logged Soils* : Conditions of water logged soils were encountered in TP's 3 and 35 in the unlined stormwater course.

7.1.4 Materials Utilisation

7.1.4(i) Backfilling of Service Trenches

The hardpan calcrete is not suitable to be used for any type of backfill due to its tendency to break into boulder and cobble sized fragments on excavation. Such fragments cannot be compacted properly on backfilling.

The colluvium can be used for normal backfilling of services trenches. However, due to the coarse granular composition thereof these materials are not suitable for pipe bedding or selected backfill around pipes.

7.1.4(ii) Construction of Paved or Segmental Block Streets

Only provisional indicators for future guidance of development are provided as far as material quality for road construction is concerned, complying with the requirements applicable to the level of investigation.

The results of the compaction testing on soil samples show the in-situ materials to be generally of G5 to G6 quality and therefore suitable for purposes of paved road or segmental block road construction. This proposal is applicable to access roads to townships and may be used successfully for subbase and base course construction.

7.1.4(iii) Wearing Course for Urban Gravel Roads

The properties to provide guidance for the use of soil materials for the structural design of a wearing course for urban gravel roads are contained in the various sub-columns of the column "Specifications for Unpaved Roads" in Table 3. The various parameters are colour-coded : Green = suitable ; red = unsuitable. The two sub-columns with a light yellow-brown background contain the parameters on which the physical behaviour of the wearing is course is determined.

From the table it is clear that none of the in-situ materials comply in all aspects to the requirements for a gravel wearing course. In most cases the use of these materials will result in a wearing course subject to raveling and corrugations. This can be attributed the non-cohesive character of most of the materials. Calcrete appears to be the material more suitable for gravel wearing course construction, although experience has taught that if a calcrete with a high PI is used for this purpose, the road surface can become slippery in wet conditions.

7.1.5 Other Considerations

The properties discussed in this subsection of the report were obtained from literature reported values based on studies done by the US Army Corps of Engineers as reported by Brink^{Reference 14.8} for compacted material. This approach is followed as the arenaceous character of the in-situ materials that did not allow the retrieval of undisturbed sampling. The typical soil properties associated with the Unified classifications of the materials are thus reported.

7.1.5(i) Compressibility

The compressibility of the material can be regarded as a necessary input to pavement design as well as lesser important supporting information for geotechnical classification for site class designation.

- *Colluvium* : The colluvium is regarded as very low compressible with cohesion (c_0) of less than $5,0\text{kNm}^{-2}$ and the effective stress envelope approximately 28° to 35° .
- *Hardpan Calcrete* : The hardpan calcrete is regarded as negligible to low compressible with cohesion (c_0) of zero to 22kNm^{-2} and the effective stress envelope approximately 28° to 38° .
- *Boulder Calcrete* : The boulder calcrete is regarded as negligible to very low compressible with cohesion (c_0) less than 5kNm^{-2} and the effective stress envelope approximately 28° to 40° .
- *Quartz-muscovite Schist Fragments* : Fragments of bedrock quartz-muscovite schist is regarded as negligibly compressible with cohesion (c_0) of less than 5kNm^{-2} and the effective stress envelope approximately 30° to 40° .

7.1.5(ii) Permeability

Permeability is an important parameter in the design of surface drainage and seepage drains. As such indicators in this regard are provided.

- *Colluvium* : The colluvium is regarded as impervious. The soil permeability coefficient exceeds $3 \times 10^{-7} \text{cms}^{-1}$.
- *Hardpan Calcrete* : The permeability of the hardpan calcrete is highly variable depending on the mode of deposition and regarded as pervious to impervious. The soil permeability coefficient varies between $(3 \pm 2) \times 10^{-7} \text{cms}^{-1}$.
- *Boulder Calcrete* : The boulder calcrete is regarded as impervious. The soil permeability coefficient varies between $2,7 \times 10^{-6}$ to $5 \times 10^{-7} \text{cms}^{-1}$.

7.1.5(iii) Erosion Potential

All soil materials encountered during the investigation can be regarded as moderately to highly resistant against erosion. The aspect of erosion potential is important in the area.

7.2 Properties of Bedrock

The TLB used to excavate the test pits did not penetrate hardpan calcrete or bedrock of schist to any significant extent and refusal of excavation occurred within millimeters after encountering these materials. It is not customary to penetrate bedrock in the case of a geotechnical investigation for purposes of a residential development. Refusal of excavation on hard rock is accepted as suitable. One can thus accept bedrock to be hard tending to very hard once refusal of excavation was encountered.

7.2.1 Calcrete

The results of the materials testing on samples of the hardpan calcrete approach that of the nodular calcrete. However, it must be borne in mind that in in-situ conditions the properties of intact hardpan calcrete approach that of soft rock rather than a gravelly sand. The grading modulus of the samples of hardpan calcrete fragments varied between 1,90 and 2,10 ; plasticity index between 1,0 and 8,0 ; and clay content less than 2%. The activity of the hardpan calcrete is described as low. The PRA classification of the calcrete is A-2-4(0) to A-1-b(0) ; and the Unified classification is SC to GC. Based on these properties and material classification the hardpan calcrete is regarded as non-expansive and no consolidation settlement and no collapse settlement can thus be expected for structures such as single storey units of masonry construction.

The test results of the samples of the hardpan calcrete reflect the properties of excavated fragments of material and not the intact mass of hardpan calcrete. It is therefore accepted that the properties of the very dense calcrete can be considered as tending towards soft rock to medium hard rock, limestone.

Brink (Reference 14.6) reports an average UCS of 32MPa for intact samples of hardpan calcrete from the Kalahari region. Using this as input to parametric calculations with Roclab software results for very dense calcrete tending to widely jointed, slightly weathered, medium hard rock, limestone result in the following properties :

- Cohesion : 1,08MPa
- Friction Angle : 24°
- Tensile Strength : 0,018MPa

- Uni-axle Compressive Strength : 550kPa
- Young's Modulus : 2340MPa

All which show a sound pedocrete, not compressible, not permeable nor subject to erosion.

7.2.2 Quartz-muscovite Schist

Parametric calculations with Roclab software results for slightly weathered, very closely jointed, very intensely laminated, medium hard rock result in the following properties :

- Cohesion : 3,4MPa
- Friction Angle : 29,0°
- Tensile Strength : 0,07MPa
- Uni-axle Compressive Strength : 2,5MPa
- Young's Modulus : 8082,4MPa

The above calculations are for schists dipping at 90° with the horizontal plane. Should the angle of dip change the tensile strength, UCS and Young's modulus may change accordingly.

7.3 Excavation Classification with Respect to Services

7.3.1 Hand Excavation

7.3.1(i) Colluvium

The colluvium can be considered as suitable to be excavated by swing tools.

7.3.1(ii) Pedogenic Deposits

The nodular and hardpan calcrete are of very dense consistency. Such material cannot be considered as suitable to be manually excavated and may as minimum require the use of a 55kW TLB, but preferably a 30 ton excavator to remove it on an economical basis.

7.3.1(iii) Bedrock

Bedrock of quartz-muscovite schist cannot be excavated manually successfully.

7.3.2 Classification of Material for Machine Excavation

In terms of Table 5 of SANS 634 : 2012 the following is applicable :

7.3.2(i) *Restricted Excavation*

- *Soft Excavation* : The colluvium and residual quartz-muscovite schist can be regarded as soft excavation. The thickness of this stratum varied between 100mm and 700mm in the test pits, averaging 250mm prior to encountering conditions of intermediate or hard rock excavation.
- *Intermediate Excavation* : Refusal of excavation with a TLB occurred in most cases soon once very dense, hardpan calcrete or slightly weathered to unweathered rock was encountered. However, some penetration into the hardpan calcrete or quartz-muscovite schist was possible and can be regarded as intermediate excavation. It was possible to penetrate between 100mm and 800mm into the hardpan calcrete and quartz-muscovite schist, averaging 320mm thick, prior to encountering hard rock excavation.
- *Hard Rock Excavation* : Refusal of excavation with the TLB occurred on conditions of hard rock excavation in all the test pits at depths varying between 200mm and 1000mm, averaging 570mm on quartz-muscovite schist or hardpan calcrete.

From the above it is clear that the transition of conditions of excavation is rapid from soft to hard rock excavation with virtually no intermediate excavation.

7.3.2(ii) *Non-restricted Excavation*

The classification as per subparagraph 7.3.2(i) : Restricted Excavation as above is also applicable for non-restricted excavation.

7.4 Seismicity

A 10% probability of an event with magnitude less than 100cms⁻² to take place once in 50 years is regarded as favourable ; and a natural seismic activity with magnitude exceeding 100cms⁻² is regarded as unfavourable. Based on a report compiled by Kijko^{Reference 14.10} a 10% probability exists that an earthquake with Peak Ground Acceleration exceeding of 0,06g may take place once in 50 years in Wegdraai.

The closest source of seismic measurements to Wegdraai under control of the Council for Geoscience is Tontelbos at 31° 10' 12"S and 20' 30' 00"E.

- The annual probability for an earthquake with intensity of 4,5 on the Modified Mercalli Scale to occur in the area is less than 10^{-0,7} ; and with an intensity of 8,5 to occur the probability is 10^{-3,8}.

- The annual probability for an earthquake with an acceleration of $10^{-1.9}g$ to occur in the area is less than $10^{-0.7}$; and with an acceleration of $10^{-0.75}g$ to occur in the area is less than $10^{-3.8}$.

To put the above information into perspective, Table 4 : Earthquake and Magnitude and Intensity, is attached to this report.

7.5 Undermining

The area of investigation is not undermined.

7.6 Dolomite Stability

The area of investigation is not subject to dolomite related instabilities.

8 SITE CLASS DESIGNATIONS

Based on the above discussions the property can be divided into four zones as per the guidelines posted by SANS 10400 : Section H^{Reference 14.11} . The zonation is indicated on Figure 6 : Site Class Designation.

8.1 Geotechnical Zone I

This zone comprises 95% of the area investigated. It is characterized by the materials profile of TP's 1 to 7, 9, 10, 12 to 16 and 20 to 31. It consists of a superficial horizon less than 400mm thick comprising of colluvium, residual quartz-muscovite schist and very dense calcrete less than 400mm thick overlying bedrock of quartz-muscovite schist. Several outcrops of calcrete occur in the area. Slope across the land is less than 2%. Foundation stresses induced by conventional strip foundations for single and double storey structures will result in almost negligible settlement if founded directly on the slightly weathered and unweathered hard rock to very hard rock, or on the very dense calcrete. The area is thus zoned as "R" and regarded as stable.

8.2 Geotechnical Zone II

This zone comprises 2% of the area investigated. The zone is present in two separate areas in the south western section of the property. It is characterized by the materials profiles of TP's 8 and 11. It consists of a horizon of colluvium exceeding 400mm thick overlying to very dense hardpan calcrete and at depth bedrock of quartz-muscovite schist. Slope across the land is less than 2%. Foundation stresses induced by conventional strip foundations for single

and double storey structures will result in limited compression settlement less than 10mm if founded directly on the medium dense colluvium. As per the materials profile encountered in the test pits the thickness of the horizon of colluvium and underlying calcrete soil is sufficient to dissipate the stresses induced by the foundations effectively. The area is thus zoned as “S” and the materials strata can be regarded as compressible to a maximum of 10mm.

TABLE 4 : EARTHQUAKE MAGNITUDE AND INTENSITY

MODIFIED MERCALLI INTENSITY SCALE	INTENSITY	DESCRIPTION	RICHTER SCALE MAGNITUDE	RADIUS OF PERCEPTIBILITY (km)
I	Instrumental	Detected only by seismography		
II	Feeble	Noted only by sensitive people	3.5 to 4.2	3 to 24
III	Slight	Like the vibrations due to a passing lorry. Felt by people at rest, especially on upper floors		
IV	Moderate	Felt by people while walking. Rocking of loose objects, including vehicles	4.3 to 4.8	24 to 48
V	Rather strong	Felt generally ; most sleepers are awakened and bells ring		
VI	Strong	Trees sway and suspended objects swing ; damage by overturning and falling of loose objects	4.9 to 5.4	48 to 112
VII	Very strong	General public alarm ; walls crack ; plaster falls	5.5 to 6.1	110 to 200
VIII	Destructive	Car drivers seriously disturbed; masonry fissured ; buildings damaged	6.2 to 6.9	200 to 400
IX	Ruinous	Houses collapse ; pipes break		
X	Disasterous	Ground cracks badly ; buildings destroyed ; railway lines bent ; landslides on steep slopes	7.0 to 7.3	400 to 700
XI	Very disasterous	Few buildings remain standing; bridges destroyed ; all services out of action ; great landslides and floods	7.4 to 8.1	400 to 700
XII	Catastrophic	Total destruction ; objects thrown into the air; ground rises and falls in waves	>8.1	400 to 700

Adapted from Project : Topline, Dated June 2020.
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is recognised

0m 80m 160m 240m 320m 400m



FIGURE 6 :
SITE CLASS DESIGNATION

LEGEND

- TP1 TEST PIT POSITION
- RUBBLE
- WASTE DISPOSAL SITE
- TRENCHES
- INFERRED MATERIAL BOUNDARY



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TAAK: Expansion and Formalisation
of Wegdraai Community

LIGGING: Erven 1, 45 and 47
of Wegdraai

KLIANT: !Kheis Municipality

TEKENING NO: Figure 6 :
DRAWING NO: Site Class Designation

DATUM: 10 September 2020

FOUNDATION DESIGN, BUILDING PROCEDURES AND PRECAUTIONARY MEASURES

AREA	AREA OF PROPERTY (%)	GEOTECHNICAL CLASS	ESTIMATED SOIL MOVEMENT (mm)	SOIL PROFILE	CONSTRUCTION TYPE	FOUNDATION DESIGN	ASSOCIATED PROBLEMS	DEVELOPMENT POTENTIAL
I	95,57	R	Negligible	Less than 400mm of colluvium and residual soil overlying bedrock and pedogenic deposits	Normal	Normal construction (strip footing or slab-on-the-ground) foundation. Founding to take place on very dense pedocretes or bedrock	Conditions of hard rock excavation. Landslope less than 2% favours slab-on-the-ground foundations. Stormwater disposal negatively effected by limited slope across the land. Large volumes of waste need to be cleared away.	Intermediate
II	1,55	S	0mm to 10mm compressible settlement	More than 400mm of colluvium and residual soil overlying bedrock and pedogenic deposits	Normal	Normal construction (strip footing or slab-on-the-ground) foundation. Founding to take place on dense to very dense pedocretes or residual soil. Foundation bearing pressure not to exceed 50kPa. Good site drainage	Conditions of hard rock excavation. Landslope less than 2% favours slab-on-the-ground foundations. Stormwater disposal negatively effected by limited slope across the land	Intermediate
III	2,88	S	0mm to 10mm compressible settlement	More than 400mm of colluvium and residual soil overlying bedrock and pedogenic deposits	Normal	Normal construction (strip footing or slab-on-the-ground) foundation. Founding to take place on dense to very dense pedocretes or residual soil. Foundation bearing pressure not to exceed 50kPa. Good site drainage	Conditions of hard rock excavation. Landslope between 2% and 6% favours strip foundations. Proximity of non-perennial stream limits development	Intermediate

8.3 Geotechnical Zone III

This zone comprises 3% of the area investigated. The zone is present in a narrow strip of land extending from the southern limit of investigation northwards along a non-perennial water course. The very dense hardpan calcrete has been removed by the seasonal presence of flood water, exposing residual quartz-muscovite schist and dense boulder calcrete. It is characterized by the materials profiles of TP's 17 to 19. It consists of a horizon of colluvium overlying residual quartz-muscovite schist and boulder calcrete exceeding 400mm thick, overlying bedrock of quartz-muscovite schist. Slope across the land is between 2% and 6%. Foundation stresses induced by conventional strip foundations for single and double storey structures will result in limited compression settlement less than 10mm if founded directly on the medium dense terrace gravels. As per the materials profile encountered in the test pits the thickness of the horizon of terrace gravels and underlying calcrete soil is sufficient to dissipate the stresses induced by the foundations effectively. The area is thus zoned as "S" and the materials strata can be regarded as compressible to a maximum of 10mm.

As this narrow zone encompasses a non-perennial stream, it unlikely that residential development will take place in it.

8.4 Other Considerations

The contents of this subparagraph 8.4 largely fall outside the scope of a geotechnical investigation and refer to the widespread presence of various types of waste as described briefly in subsections 4.5 and 6.3.4 of this document. However, it is given in good faith in an effort to find a solution to the presence of waste in the area. To implement these measures will require inputs from both the local municipal authorities as well as the community of Wegdraai.

An excavation for waste disposal in the area is already in existence. Based on current regulations this excavation may not be used as waste disposal site due to its proximity to the village. However, it may be backfilled or partially backfilled by the stockpiles of soil and gravels on site as a measure of land rehabilitation, thereby reducing the danger of injuries or death to children. Similarly can the series of trenches on the northern perimeter of the site between TP's 5 and 9 be backfilled, making the land suitable for the construction of residences.

In the village and immediate surroundings thereof it was clear that household waste is present in extreme distribution over the entire area. Based on a visual appraisal of the conditions the "dirty" content of this waste renders the proposal of separating and recycling as not viable and it need to be removed to a suitable waste disposal site.

9 FOUNDATION RECOMMENDATIONS AND SOLUTIONS

The foundation design alternatives and ancillary issues as discussed in subparagraphs 9.1 and 9.4 below are summarized in Table 5 : Foundation Design, Building Procedures and Precautionary Measures. In some cases more than one foundation solution is offered in the discussion below. Whichever option is used, the design must adhere strictly on the proposals of SANS 10400H. As geotechnical conditions favour the use of both alternatives, the decision of which option to use must be based on financial and practical considerations. In all cases service trenches shall not be excavated parallel to buildings within 1500mm of the building perimeter.

9.1 Geotechnical Zone I

The zone is classed as R, meaning that the proposed horizon for founding is stable and negligible soil movement is expected. Considering the limited slope across the land of less than 2% only and the favourable geotechnical site classification as per Section 8 above, two foundation design alternatives are applicable to the zone.

9.1.1 Strip Foundations

Foundations of 400mm wide placed directly on the very dense hardpan calcrete may be used. Should the areas of the proposed dwellings not exceed 200m² foundations for internal non-loadbearing walls may consist of thickened floorslabs. Should this option be adopted the floorslabs shall be reinforced steel mesh.

9.1.2 Slab-on-the-ground Foundations

This is the preferred method of founding. The solution of slab-on-the-ground foundations may only be used for dwellings less than 200m² in area. Edge beams shall be placed directly on the very dense hardpan calcrete.

Foundations for internal non-loadbearing walls shall consist of thickened floorslabs. The foundations shall not contain any changes in surface levels with steps exceeding 400mm and do not support any chimneys or walls which support concrete roofs.

9.2 Geotechnical Zone II

The zone is classed as S, meaning that less than 10mm of compression settlement may occur. Considering the slope across the land is less than 2% and the stable geotechnical site

TABLE 5 : FOUNDATION DESIGN, BUILDING PROCEDURES AND PRECAUTIONARY MEASURES

AREA	AREA OF PROPERTY (%)	GEOTECH NICAL CLASS	ESTIMATED SOIL MOVEMENT (mm)	SOIL PROFILE	CONSTRUCTION TYPE	FOUNDATION DESIGN AND BUILDING PROCEDURES	ASSOCIATED PROBLEMS	DEVELOPMENT POTENTIAL
I		R	Negligible	Less than 400mm of colluvium and residual soil overlying bedrock and pedogenic deposits	Normal	Normal construction (strip footing or slab-on-the-ground) foundation. Founding to take place on very dense pedocretes or bedrock	Conditions of hard rock excavation Landslope less than 2% favours slab-on-the-ground foundations. Stormwater disposal negatively effected by limited slope across the land Large volumes of waste need to be cleared away.	Intermediate
II		S	0mm to 10mm compression settlement	More than 400mm of colluvium and residual soil overlying bedrock and pedogenic deposits	Normal	Normal construction (strip footing or slab-on-the-ground) foundation. Founding to take place on dense to very dense pedocretes or residual soil Foundation bearing pressure not to exceed 50kPa Good site drainage	Conditions of hard rock excavation Landslope less than 2% favours slab-on-the-ground foundations. Stormwater disposal negatively effected by limited slope across the land	Intermediate
III		S	0mm to 10mm compression settlement	More than 400mm of colluvium and residual soil overlying bedrock and pedogenic deposits	Normal	Normal construction (strip footing or slab-on-the-ground) foundation. Founding to take place on dense to very dense pedocretes or residual soil Foundation bearing pressure not to exceed 50kPa Good site drainage	Conditions of hard rock excavation Landslope between 2% and 6% favours strip foundations Proximity of non-perennial stream limits development	Intermediate

classification as per Section 8 above, two foundation design alternatives are applicable to the zone.

9.2.1 Strip Foundations

Foundations of 400mm wide placed directly on the very dense hardpan calcrete may be used. Should the areas of the proposed dwellings not exceed 200m² foundations for internal non-loadbearing walls may consist of thickened floorslabs. Should this option be adopted the floorslabs shall be reinforced steel mesh.

9.2.2 Slab-on-the-ground Foundations

This is the preferred method of founding. The solution of slab-on-the-ground foundations may only be used for dwellings less than 200m² in area. Edge beams shall be placed directly on the very dense hardpan calcrete.

Foundations for internal non-loadbearing walls shall consist of thickened floorslabs. The foundations shall not contain any changes in surface levels with steps exceeding 400mm and do not support any chimneys or walls which support concrete roofs.

9.3 Geotechnical Zone III

The zone is classed as S, meaning that less than 10mm of compression settlement may occur. Cognizance must be taken of the proximity of the non-perennial stream central to this area. Considering the slope across the land of approximately 2% to 6% and the stable geotechnical site classification as per Section 8 above, two foundation design alternatives are applicable to the zone.

9.3.1 Strip Foundations

This is the preferred method of founding. Foundations of 400mm wide placed directly on the medium dense terrace gravels may be used. Should the areas of the proposed dwellings not exceed 200m² foundations for internal non-loadbearing walls may consist of thickened floorslabs. Should this option be adopted the floorslabs shall be reinforced steel mesh.

9.3.2 Slab-on-the-ground Foundations

The solution of slab-on-the-ground foundations may only be used for dwellings less than 200m² in area. Edge beams shall be placed directly on the medium dense terrace gravels. Foundations for internal non-loadbearing walls shall consist of thickened floorslabs. The

foundations shall not contain any changes in surface levels with steps exceeding 400mm and do not support any chimneys or walls which support concrete roofs.

10 DRAINAGE

The water courses on site are contained in narrow and well-defined gullies of such extent that they do not influence the various geotechnical site class designations. They are therefore not zoned separately. However, the presence of these water courses must be taken into account and infrastructure established only in a safe distance from these features.

The slope of less than 2% in certain areas of the land is regarded as marginal and may result in problems with the design of stormwater and sewerage disposal systems depending on dissipation by gravity.

11 SPECIAL PRECAUTIONARY MEASURES

No extraordinary features requiring special precautionary measures to decrease the impact thereof are present on site, except that waste and litter are present abundantly and need to be cleared up.

12 CONCLUSIONS

The property is regarded as being of intermediate suitability for residential development. Founding conditions can be defined as R and S. The only factors that reduce the suitability of the land for development are :

- The presence of hard rock and very dense hardpan calcrete close to the surface. The presence thereof will result in conditions of hard excavation. On the other hand it provides conditions favouring conventional methods of founding.
- The limited slope of less than 2% in Geotechnical Zones I and II will have a detrimental influence on the design of stormwater disposal systems and sewerage reticulation.
- The presence of waste material need to be addressed.

The conclusions as based on the site conditions are summarized in Table 6 : Influence of Constraints per Geotechnical Zoning. This classification is based on the proposals of the document *Geotechnical Site Investigations for Housing Developments (Generic Specification GFSH-2)*, issued by the National Department of Housing in September 2002.

TABLE 6 : INFLUENCE OF CONSTRAINTS PER GEOTECHNICAL ZONING

CONSTRAINT	KEY TO CLASSIFICATION			CLASSIFICATION PER GEOTECHNICAL ZONE		
	MOST FAVOURABLE (1)	INTERMEDIATE (2)	LEAST FAVOURABLE (3)	I	II	III
Collapsible soil	Any collapsible horizon or consecutive horizons totalling a depth of less than 750mm in thickness	Any collapsible horizon or consecutive horizons with a depth of more than 750mm in thickness	A least favourable situation for this constraint does not occur			
Seepage	Permanent or perched water table more than 1,5m below ground surface	Permanent or perched water table less than 1,5m below ground surface	Swamps and marshes			
Active soil	Low soil heave potential anticipated	Moderate soil heave potential anticipated	High soil heave potential anticipated			
Highly compressible soil	Low soil compressibility anticipated	Moderate soil compressibility anticipated	High soil compressibility anticipated			
Erodibility of Soil	Low	Intermediate	High			
Difficulty of excavation to 1,5m depth	Scattered or occasional boulders less than 10% of the total volume	Rock or hardpan pedocretes between 10% and 40% of the total volume	Rock or hardpan pedocretes more than 40% of the total volume			
Undermined ground	Undermining at a depth greater than 240m below surface, except where total extraction mining has not occurred	Old undermined areas to a depth of 90m to 240m below surface where slope closure has ceased	Mining within less than 90m to 240m of surface or where total extraction mining has taken place			
Dolomite and limestone stability	Possibly stable. Areas of dolomite overlain by Karoo rocks or intruded by sills. Areas of Black Reef rocks. Anticipated Inherent Risk Class 1	Potentially characterised by instability. Anticipated Inherent Risk Classes 2 to 5	Known sinkholes and dolines. Anticipated Inherent Risk Classes 6 to 8			
Steep slopes*	Between 2° and 6° in all regions	Slopes between 6° and 18° and less than 2° (Natal and Western Cape) Slopes between 6° and 12° and less than 2° (all other regions)	More than 18° (Natal and Western Cape). More than 12° (all other regions)			
Areas of unstable natural slopes*	Low risk	Intermediate risk	High risk (Especially in areas subject to seismic activity)			
Areas subject to seismic activity	10% probability of an event less than 100cms ⁻² within 50 years	Mining induced seismic activity more than 100cms ⁻²	Natural seismic activity more than 100cms ⁻²			
Areas subject to flooding	A "most favourable" situation for this constraint does not occur	Areas adjacent to a known drainage channel or floodplain with slope less than 1%	Areas with a known drainage channel or floodplain			

12.1 Stratigraphy

The available information shows that the area of investigation is located on a subduction zone dating approximately 1000 million years old. The zone is located between the lithology of the Kaapvaal Craton and the Namaqua-Natal mobile belt. The remains of the original geology in the area are referred to as the Kaaien Terrane and the site is located on the Groblershoop Formation of the Brulpan Group. The quartz-muscovite schist is described as pale white mottled light green, intensely laminated, closely jointed, soft rock becoming hard rock with depth. While the laminations are generally closed smooth and clean ; the condition of the joints may vary from closed, smooth and clean to open smooth and containing fine, white calcareous sand.

12.2 Soil Profile

12.2.1 Colluvium

On site colluvium as surface deposit was found in all the test pits except TP's 12, 24, 27 and 31. The colluvium is not a homogenous material on site due to a variable gravel content. The matrix of the colluvium consists light brown fine sand and clasts of gravels and cobbles of quartz and some calcrete. With an increase in clasts from matrix supported to clast supported the consistency of the colluvium improves from loose to medium dense. The matrix of the colluvium remains intact throughout. The horizon of colluvium was between 100mm and 600mm thick in the test pits.

12.2.2 Mokalanen Formation

12.2.2(i) *Hardpan Calcrete*

Very dense hardpan calcrete was encountered in TP's 1, 2, 5 to 16, 20, 23 to 29 and 31. It is present dirty white, very fine grained, very dense hardpan calcrete. Small pockets and lenses of red sand may be contained in the pedocretic matrix. The calcrete was present as outcrops in TP's 12, 24, 27 and 31. Elsewhere it underlies the colluvium, occurring from depths between 150mm and 600mm minimum, extending to 200mm to 1000mm maximum.

12.2.2(ii) *Boulder Calcrete*

Very dense boulder calcrete was encountered in TP's 3, 4, 17, 18 and 30. It is present tightly packets cobbles and boulders up to 500mm in diameter of calcrete in a matrix of light red sand. dirty white, very fine grained, very dense hardpan calcrete. Small pockets and lenses of red

sand may be contained in the pedocretic matrix. It underlies the colluvium, occurring from depths between 100mm and 400mm minimum, extending to 300mm to 1000mm maximum.

12.2.3 Residual Quartz-muscovite Schist

Residual quartz-muscovite schist was encountered in TP 19 only. It underlies the colluvium from a depth of 200mm extending to 700mm at which bedrock was encountered. The residual quartz-muscovite schist is described as abundant clast supported, coarse angular gravels of schist in a matrix of dark red brown fine sand. The consistency is dense.

12.3 Groundwater

12.3.1 Perched Water

Perched groundwater was not encountered in any of the test pits excavated for this investigation. It is anticipated that perched water will generally not prove problematic on the site.

12.3.2 Permanent Groundwater

The probability for drilling successfully for water in the area is between 40% and 60%, and the probability that such a borehole will yield more than 2l/s is between 10% and 20%. Groundwater is expected to occur at depths less than 15 meters in compact, argillaceous strata.

12.4 Conditions of Excavation

On average over the entire site bedrock or refusal of excavation on very dense hardpan calcrete or quartz-muscovite schist occurred in all the test pits at depths varying between 200mm and 1000mm, averaging 570mm. The implication of this is that should trenches require excavated depths to 1000mm, 43% of the excavation may be classified as hard, requiring drilling and blasting. Should the required depth of excavation increase to 1500mm, 62% of the excavation may be classified as hard.

Irrespective of which method of excavation is considered, the most important issue is that across the entire site the depth to bedrock and hardpan calcrete can be regarded as hard rock excavation that is variable as follows :

12.4.1 Geotechnical Zone I

This zone is classified as R. The average depth to bedrock or very dense pedocrete is 220mm. Refusal of excavation occurred at an average depth of 510mm. The implication of this is that should trenches require excavated depths to 1000mm, 49% of the excavation may be classified as hard, requiring drilling and blasting. Should the required depth of excavation increase to 1500mm, 67% of the excavation may be classified as hard.

12.4.2 Geotechnical Zones II and III

These zones are classified as S. The average depth to bedrock is 520mm. Refusal of excavation occurred at an average depth of 860mm. The implication of this is that should trenches require excavated depths to 1000mm, 86% of the excavation may be classified as soft, suitable for TLB excavation. Should the required depth of excavation increase to 1500mm, 43% of the excavation may be classified as hard, requiring drilling and blasting.

12.5 Site Class Designation

It is concluded that the entire area is regarded as suitable for residential development as follows :

12.5.1 Geotechnical Zone I

The zone is classed as R, meaning that the proposed horizon for founding is stable and negligible soil movement is expected. The distribution thereof encompasses 95% of the proposed area for development. Slope across the land is less than 2%. Considering the limited slope and the stable geotechnical site classification, two foundation design alternatives are applicable to the zone, namely conventional strip foundations or slab-on-the-ground foundations placed directly on bedrock or very dense pedocrete.

Geotechnical conditions related to foundation design can be regarded as favourable, but the conditions of hard rock excavation close to the surface and slope less than 2% detract from the suitability of establishing services and overall the development potential is regarded as intermediate only.

12.5.2 Geotechnical Zone II

The zone is classed as S, meaning that the proposed horizon for founding is slightly compressible and rapid settlement less than 10mm is expected. The distribution thereof encompasses 2% of the proposed area for development. Slope across the land is less than

2%. Considering the limited slope and the favourable geotechnical site classification, two foundation design alternatives are applicable to the zone, namely conventional strip foundations or slab-on-the-ground foundations placed directly on medium dense terrace gravels.

Geotechnical conditions related to foundation design can be regarded as favourable, but the conditions of hard rock excavation close to the surface and slope less than 2% detract from the suitability of establishing services and overall the development potential is regarded as intermediate only.

12.5.3 Geotechnical Zone III

The zone is classed as S, meaning that the proposed horizon for founding is slightly compressible and rapid settlement less than 10mm is expected. The distribution thereof encompasses 3% of the proposed area for development. Slope across the land is between 2% and 6%. Considering the limited slope and the favourable geotechnical site classification, two foundation design alternatives are applicable to the zone, namely conventional strip foundations or slab-on-the-ground foundations placed directly on medium dense terrace gravels. The more viable foundation alternative therefore remains founding by conventional strip foundations.

Geotechnical conditions related to foundation design can be regarded as favourable, but the conditions of hard rock excavation close to the surface detracts from the suitability of establishing services and overall the development potential is regarded as intermediate only.

12.6 Land Slope

The average slope across the larger part of the land is less than 2%. Only in Geotechnical Zones III does the slope exceed 2%, that is over 3% of the site. This slope of less than 2% has a detrimental influence on especially the design of a stormwater disposal system depending on gravity to dissipate of the surface water due to downpours. The land slope also affects the design of the sewerage disposal but to a lesser extent as the gradient of the pipes can be adjusted according to design requirements.

No steep slopes are present on the property.

12.7 Areas Subject to Flooding

The non-perennial water courses on site are contained in well-defined, narrow gullies and

may be regarded as being of lesser importance, requiring no additional precautionary measures to ensure the safety of the population against flooding.

12.8 Materials Utilization

- *Trench Backfilling* : None of the materials are suitable for selected fill or pipe bedding. With exception of the hardpan calcrete all materials can be used for normal backfill.
- *Layerworks for Paved or Segmental Block Paving* : The residual soils are suitable for the construction of subbase and base course construction for lightly trafficked roads.
- *Wearing Course for Gravel Roads in Urban Areas* : None of the soil materials are 100% suitable for this purpose, but calcrete is the most suitable present. The use of these materials will generally result in a road surface subject to raveling and corrugations.

12.9 Other Considerations

- *Undermining* : The area is not subject to undermining.
- *Seismic Activity* : The Peak Ground Acceleration expected in 50 years is 0,06g. A low risk for the development of earth tremors therefore exist.
- *Soil Corrosivity* : The in-situ soils and pedocretes are not corrosive due to acidic properties, but corrosive due to high soluble salts contents.
- *Dolomite* : The area of investigation is not subject to any restrictions due to the presence of dolomite. Bedrock of dolomite does not occur in the area of investigation.

13 RECOMMENDATIONS

13.1 Foundation and Structural Design

Section 9 of this document provides guidelines for foundation and structural design. These guidelines are based strictly on the contents of SANS 10400H and the NHBRC Home Owners Manual published in 2015. It is recommended that development take place strictly according to these guidelines. More than one founding solution is applicable on the site, and the property developer can base his choice on financial constraints.

13.2 Materials Utilization

- *Trench Backfill* : With exception of the hardpan calcrete, the in-situ materials may be used for normal backfill of trenches. The hardpan calcrete shall be spoilt and not used at all for this purpose. Material for pipe bedding and selected backfill shall be obtained from commercial sources.

- *Layerworks for Paved or Segmental Block Paving* : Material for subbase and base construction may be obtained from excavated calcrete and colluvium. It is recommended that a centerline investigation consisting of test pitting and soil sampling be conducted to allow the consulting engineer to produce suitable pavement designs for the project.
- *Wearing Course for Gravel Roads in Urban Areas* : The calcrete can be used for the construction of a gravel wearing course.

13.4 Conditions of Excavation

Although manual excavation is possible through the colluvium, residual soil and to some extent through the calcrete, it is considered as not an economic proposition, mostly due to the consistency and composition of the soil. Excavation through these soils shall require the use of a TLB rated at 55kW minimum, or preferably a 30 ton excavator of the very dense pedocretes need to be removed. It is recommended that adequate provision be made for hard rock excavation.

13.5 Land Slope

Slope across the 97% of the land is less than 2%. This is regarded as being of intermediate suitability for urban development only. This has an influence on especially the stormwater disposal system but to a lesser extent on the waste water design. In theory the slope of 2% to 6% on 2% of the land can be regarded as favourable for urban development, but the combination of the slope and presence of rock outcrops result in conditions less desirable for development.

14 SOURCES OF REFERENCE

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FJ Breytenbach, Pr Eng
For Cedar Land Geotechnical Consult (Pty) Ltd

11 September 2020

**GEOTECHNICAL CONDITIONS ON ERVEN 1, 45 AND
47 OF WEGDRAAI: A REPORT FOR THE EXPANSION
AND FORMALISATION OF WEGDRAAI COMMUNITY**

2020/J09/MCP_01

ADDENDUM A: TEST PIT PROFILES

TRIAL HOLE: 1 PROJECT: EXPANSION AND FORMALISATION OF WEGDRAAI COMMUNITY LOGGED BY: FJB SITE: ERVEN 1, 45 AND 47 OF WEGDRAAI CLIENT: IKHEIS MUNICIPALITY DATE LOGGED: 8/7/2020 LOCATION: 28°50'26,9" S 21°51'17,3" E		<i>Cedar Land Geotechnical Consult (Pty) Ltd</i> P O Box 607 Ceres 6835 Cell: 082 570 2767 Email: cedarland.frans@breede.co.za
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Depth (m)	Legend	PROFILE	SAMPLE			Remarks
			Number	Type	Symbol	
0.00		Ground Surface				NOTES: 1 Refusal of excavation at 400 mm on very dense hardpan calcrete.
		Dry, light brown, loose, intact, fine SAND and matrix supported, medium coarse, subangular, gravels of quartz and cobbles of calcrete. Colluvium.	U9267	0-0,3	●	
0.20						
		Dirty white, very fine grained, very dense, hardpan CALCRETE with pockets of dry, light red, fine sand. Pedogenic deposits.				
0.40						
0.60						
0.80						
1.00						

Contractor: ALS Plant Hire Date Drilled: 8/7/2020 Machine: Bell 315SK	Hole Diameter: 600 mm Water Depth: Sheet: 1 of 1
SOIL PROFILE: TEST PIT 1	FIGURE: A1

<p style="text-align: center;">TRIAL HOLE: 2</p> <p>PROJECT: EXPANSION AND FORMALISATION OF WEGDRAAI COMMUNITY</p> <p style="text-align: center;">LOGGED BY: FJB</p> <p>SITE: ERVEN 1, 45 AND 47 OF WEGDRAAI</p> <p style="text-align: center;">DATE LOGGED: 8/7/2020</p> <p>CLIENT: !KHEIS MUNICIPALITY</p> <p style="text-align: center;">LOCATION: 28°50'30,2" S 21°51'18,9" E</p>	<p><i>Cedar Land Geotechnical Consult (Pty) Ltd</i></p> <p>P O Box 607 Ceres 6835</p> <p>Cell: 082 570 2767</p> <p>Email: cedarland.frans@breede.co.za</p>
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Depth (m)	Legend	PROFILE	SAMPLE			Remarks
			Number	Type	Symbol	
0.00		Ground Surface				NOTES: 1 Refusal of excavation at 400 mm on very dense hardpan calcrete.
0.20		Dry, light red brown, loose, intact, fine SAND and matrix supported, medium coarse, subrounded and subangular, gravels of quartz. Colluvium.				
0.40		Dirty white, very fine grained, very dense, hardpan CALCRETE with minor inclusions of quartz-muscovite schist. Pedogenic deposits.				
0.60						
0.80						
1.00						

- √ Water encountered
- ↓ Water level
- ┐ Bottom of hole
- Approximate material change
- Disturbed sample
- Undisturbed sample

Contractor: ALS Plant Hire Date Drilled: 8/7/2020 Machine: Bell 315SK	Hole Diameter: 600 mm Water Depth: Sheet: 1 of 1
SOIL PROFILE: TEST PIT 2	
FIGURE: A2	

TRIAL HOLE: 3 PROJECT: EXPANSION AND FORMALISATION OF WEGDRAAI COMMUNITY LOGGED BY: FJB SITE: ERVEN 1, 45 AND 47 OF WEGDRAAI CLIENT: !KHEIS MUNICIPALITY DATE LOGGED: 8/7/2020 LOCATION: 28°50'33,8" S 21°51'20,7" E		Cedar Land Geotechnical Consult (Pty) Ltd P O Box 607 Ceres 6835 Cell: 082 570 2767 Email: cedarland.frans@breede.co.za
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Depth (m)	Legend	PROFILE	SAMPLE			Remarks
			Number	Type	Symbol	
0.00		Ground Surface				NOTES: 1 Refusal of excavation at 700 mm on very dense boulder calcrete.
		Dry, light red brown, loose, intact, fine SAND. Colluvium.				
0.20		Dry, light red brown, loose, intact, fine SAND and matrix supported, medium coarse, subrounded and subangular, gravels of quartz. Colluvium.				
0.40		Abundant, clast supported, boulders (± 500 mm in diameter) of calcrete in a matrix of dry, red brown, fine sand, boulder CALCRETE. Overall consistency is very dense. Pedogenic deposits.				
0.60						
0.80						
1.00						

Contractor: ALS Plant Hire Date Drilled: 8/7/2020 Machine: Bell 315SK	Hole Diameter: 600 mm Water Depth: Sheet: 1 of 1
SOIL PROFILE: TEST PIT 3	FIGURE: A3

TRIAL HOLE: 4 PROJECT: EXPANSION AND FORMALISATION OF WEGDRAAI COMMUNITY LOGGED BY: FJB SITE: ERVEN 1, 45 AND 47 OF WEGDRAAI CLIENT: !KHEIS MUNICIPALITY DATE LOGGED: 8/7/2020 LOCATION: 28°50'37,9" S 21°51'22,2" E		Cedar Land Geotechnical Consult (Pty) Ltd P O Box 607 Ceres 6835 Cell: 082 570 2767 Email: cedarland.frans@breede.co.za
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Depth (m)	Legend	PROFILE	SAMPLE			Remarks
			Number	Type	Symbol	
0.00		Ground Surface				NOTES: 1 Refusal of excavation at 500 mm on very dense boulder calcrete.
0.20		Dry, light red brown, loose, intact, fine SAND and matrix supported, medium coarse, subrounded and subangular, gravels of quartz. Colluvium.				
0.40		Abundant, clast supported, boulders (± 500 mm in diameter) of calcrete in a matrix of dry, red brown, fine sand, boulder CALCRETE. Overall consistency is very dense. Pedogenic deposits.				
0.60						
0.80						
1.00						




Contractor: ALS Plant Hire Date Drilled: 8/7/2020 Machine: Bell 315SK	Hole Diameter: 600 mm Water Depth: Sheet: 1 of 1
SOIL PROFILE: TEST PIT 4	FIGURE: A4







<p style="text-align: center;">TRIAL HOLE: 5</p> <p>PROJECT: EXPANSION AND FORMALISATION OF WEGDRAAI COMMUNITY</p> <p style="text-align: center;">LOGGED BY: FJB</p> <p>SITE: ERVEN 1, 45 AND 47 OF WEGDRAAI</p> <p style="text-align: center;">DATE LOGGED: 8/7/2020</p> <p>CLIENT: !KHEIS MUNICIPALITY</p> <p style="text-align: center;">LOCATION: 28°50'24,7" S 21°51'20,7" E</p>	<p><i>Cedar Land Geotechnical</i> <i>Consult (Pty) Ltd</i> P O Box 607 Ceres 6835 Cell: 082 570 2767 Email: cedarland.frans@breede.co.za</p>
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Depth (m)	Legend	PROFILE	SAMPLE			Remarks
			Number	Type	Symbol	
0.00		Ground Surface				NOTES: 1 Refusal of excavation at 400 mm on very dense hardpan calcrete.
0.20		Dry, light red brown, loose, intact, fine SAND and matrix supported, medium coarse, angular gravels of calcrete and angular to subangular, medium coarse, gravels of quartz. Colluvium.				
0.40		Dirty white, very fine grained, very dense, hardpan CALCRETE with pockets of dry, light red, fine sand. Pedogenic deposits.				
0.60						
0.80						
1.00						

Contractor: ALS Plant Hire Date Drilled: 8/7/2020 Machine: Bell 315SK	Hole Diameter: 600 mm Water Depth: Sheet: 1 of 1
SOIL PROFILE: TEST PIT 5	FIGURE: A5



TRIAL HOLE: 6 PROJECT: EXPANSION AND FORMALISATION OF WEGDRAAI COMMUNITY LOGGED BY: FJB SITE: ERVEN 1, 45 AND 47 OF WEGDRAAI CLIENT: !KHEIS MUNICIPALITY DATE LOGGED: 8/7/2020 LOCATION: 28°50'28,1" S 21°51'23,5" E		Cedar Land Geotechnical Consult (Pty) Ltd P O Box 607 Ceres 6835 Cell: 082 570 2767 Email: cedarland.frans@breede.co.za
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Depth (m)	Legend	PROFILE	SAMPLE			Remarks
			Number	Type	Symbol	
0.00		Ground Surface				NOTES: 1 Refusal of excavation at 400 mm on very dense hardpan calcrete.
		Dry, light red brown, loose, intact, fine SAND and matrix supported, medium coarse, subangular gravels of quartz and cobbles of calcrete. Colluvium.				
0.20		Dirty white, very fine grained, very dense, hardpan CALCRETE with pockets of dry, light red, fine sand. Pedogenic deposits.	U9268	0-0.4		
0.40						
0.60						
0.80						
1.00						

-  Water encountered
-  Water level
-  Bottom of hole
-  Approximate material change
-  Disturbed sample
-  Undisturbed sample

Contractor: ALS Plant Hire Date Drilled: 8/7/2020 Machine: Bell 315SK	Hole Diameter: 600 mm Water Depth: Sheet: 1 of 1
SOIL PROFILE: TEST PIT 6	
FIGURE: A6	

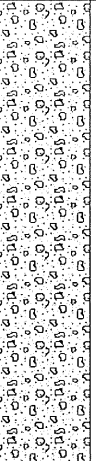
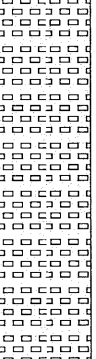
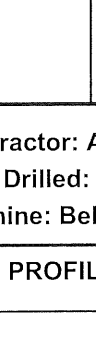
TRIAL HOLE: 7 PROJECT: EXPANSION AND FORMALISATION OF WEGDRAAI COMMUNITY LOGGED BY: FJB SITE: ERVEN 1, 45 AND 47 OF WEGDRAAI CLIENT: !KHEIS MUNICIPALITY DATE LOGGED: 8/7/2020 LOCATION: 28°50'32,2" S 21°51'26,3" E		<i>Cedar Land Geotechnical Consult (Pty) Ltd</i> P O Box 607 Ceres 6835 Cell: 082 570 2767 Email: cedarland.frans@breede.co.za
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




Depth (m)	Legend	PROFILE	SAMPLE			Remarks
			Number	Type	Symbol	
0.00		Ground Surface				NOTES: 1 Refusal of excavation at 400 mm on very dense hardpan calcrete.
		Dry, light red brown, loose, intact, fine SAND and matrix supported, medium coarse, subangular gravels of quartz and cobbles of calcrete. Colluvium.				
0.20		Dirty white, very fine grained, very dense, hardpan CALCRETE with pockets of dry, light red, fine sand. Pedogenic deposits.				
0.40						
0.60						
0.80						
1.00						

-  Water encountered
-  Water level
-  Bottom of hole
-  Approximate material change
-  Disturbed sample
-  Undisturbed sample

Contractor: ALS Plant Hire Date Drilled: 8/7/2020 Machine: Bell 315SK	Hole Diameter: 600 mm Water Depth: Sheet: 1 of 1
SOIL PROFILE: TEST PIT 7	
FIGURE: A7	

TRIAL HOLE: 8 PROJECT: EXPANSION AND FORMALISATION OF WEGDRAAI COMMUNITY LOGGED BY: FJB SITE: ERVEN 1, 45 AND 47 OF WEGDRAAI CLIENT: !KHEIS MUNICIPALITY DATE LOGGED: 8/7/2020 LOCATION: 28°50'35,5" S 21°51'27,9" E		Cedar Land Geotechnical Consult (Pty) Ltd P O Box 607 Ceres 6835 Cell: 082 570 2767 Email: cedarland.frans@breede.co.za
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Depth (m)	Legend	PROFILE	SAMPLE			Remarks
			Number	Type	Symbol	
0.00		Ground Surface				NOTES: 1 Refusal of excavation at 900 mm on very dense hardpan calcrete.
0.20		Abundant, clast supported, medium coarse to coarse, subrounded and rounded GRAVELS of quartz and singular COBBLES of quartz in a matrix of dry, light red, fine sand. Overall consistency is medium dense. Colluvium.				
0.40						
0.60		Dirty white mottled light grey stained light brown, very fine grained, very dense, hardpan CALCRETE. Pedogenic deposits.				
0.80						
1.00						

-  Water encountered
-  Water level
-  Bottom of hole
-  Approximate material change
-  Disturbed sample
-  Undisturbed sample

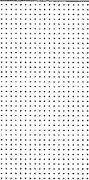
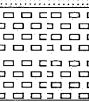
Contractor: ALS Plant Hire
 Date Drilled: 8/7/2020
 Machine: Bell 315SK







Hole Diameter: 600 mm
 Water Depth:
 Sheet: 1 of 1

SOIL PROFILE: TEST PIT 8

FIGURE: A8

TRIAL HOLE: 9 PROJECT: EXPANSION AND FORMALISATION OF WEGDRAAI COMMUNITY LOGGED BY: FJB SITE: ERVEN 1, 45 AND 47 OF WEGDRAAI CLIENT: !KHEIS MUNICIPALITY DATE LOGGED: 8/7/2020 LOCATION: 28°50'22,1" S 21°51'25,2" E		Cedar Land Geotechnical Consult (Pty) Ltd P O Box 607 Ceres 6835 Cell: 082 570 2767 Email: cedarland.frans@breede.co.za
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Depth (m)	Legend	PROFILE	SAMPLE			Remarks
			Number	Type	Symbol	
0.00		Ground Surface				NOTES: 1 Refusal of excavation at 300 mm on very dense hardpan calcrete.
		Dry, light red brown, loose, intact, fine SAND and matrix supported, medium coarse, angular gravels of calcrete and angular to subangular, medium coarse, gravels of quartz. Colluvium.				
0.20		Dirty white, very fine grained, very dense, hardpan CALCRETE with pockets of dry, light red, fine sand. Pedogenic deposits.				
0.40						
0.60						
0.80						
1.00						

-  Water encountered
-  Water level
-  Bottom of hole
-  Approximate material change
-  Disturbed sample
-  Undisturbed sample

Contractor: ALS Plant Hire
 Date Drilled: 8/7/2020
 Machine: Bell 315SK

Hole Diameter: 600 mm
 Water Depth:
 Sheet: 1 of 1

SOIL PROFILE: TEST PIT 9

FIGURE: A9



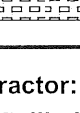






<p style="text-align: center;">TRIAL HOLE: 10</p> <p>PROJECT: EXPANSION AND FORMALISATION OF WEGDRAAI COMMUNITY</p> <p style="text-align: center;">LOGGED BY: FJB</p> <p>SITE: ERVEN 1, 45 AND 47 OF WEGDRAAI</p> <p style="text-align: center;">DATE LOGGED: 8/7/2020</p> <p>CLIENT: !KHEIS MUNICIPALITY</p> <p style="text-align: center;">LOCATION: 28°50'25,7" S 21°51'28,1" E</p>	<p><i>Cedar Land Geotechnical</i> <i>Consult (Pty) Ltd</i> P O Box 607 Ceres 6835 Cell: 082 570 2767 Email: cedarland.frans@breede.co.za</p>
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Depth (m)	Legend	PROFILE	SAMPLE			Remarks
			Number	Type	Symbol	
0.00		Ground Surface				NOTES: 1 Refusal of excavation at 300 mm on very dense hardpan calcrete.
		Dry, light red brown, loose, intact, fine SAND and matrix supported, medium coarse, angular gravels of calcrete and angular to subangular, medium coarse, gravels of quartz. Colluvium.				
0.20		Dirty white, very fine grained, very dense, hardpan CALCRETE with pockets of dry, light red, fine sand. Pedogenic deposits.				
0.40						
0.60						
0.80						
1.00						

- √ Water encountered
- ↓ Water level
- └─ Bottom of hole
- Approximate material change
- Disturbed sample
- Undisturbed sample

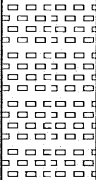



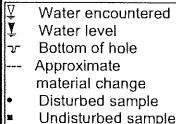
Contractor: ALS Plant Hire Date Drilled: 8/7/2020 Machine: Bell 315SK	Hole Diameter: 600 mm Water Depth: Sheet: 1 of 1
SOIL PROFILE: TEST PIT 10	
FIGURE: A10	

<p style="text-align: center;">TRIAL HOLE: 11</p> <p>PROJECT: EXPANSION AND FORMALISATION OF WEGDRAAI COMMUNITY</p> <p style="text-align: center;">LOGGED BY: FJB</p> <p>SITE: ERVEN 1, 45 AND 47 OF WEGDRAAI</p> <p style="text-align: center;">DATE LOGGED: 8/7/2020</p> <p>CLIENT: !KHEIS MUNICIPALITY</p> <p style="text-align: center;">LOCATION: 28°50'30,0" S 21°51'29,6" E</p>	<p><i>Cedar Land Geotechnical Consult (Pty) Ltd</i></p> <p>P O Box 607</p> <p>Ceres</p> <p>6835</p> <p>Cell: 082 570 2767</p> <p>Email: cedarland.frans@breede.co.za</p>
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Depth (m)	Legend	PROFILE	SAMPLE			Remarks
			Number	Type	Symbol	
0.00		Ground Surface				NOTES: 1 Refusal of excavation at 1000 mm on very dense hardpan calcrete.
0.20		Abundant, clast supported, medium coarse to coarse, subrounded and rounded GRAVELS of quartz and singular COBBLES of quartz in a matrix of dry, light red, fine sand. Overall consistency is medium dense. Colluvium.				
0.40		Dirty white mottled light grey stained light brown, very fine grained, very dense, hardpan CALCRETE. Pedogenic deposits.				
0.60						
0.80						<div style="font-size: small;">  Water encountered  Water level  Bottom of hole  Approximate material change  Disturbed sample  Undisturbed sample </div>
1.00						



Contractor: ALS Plant Hire Date Drilled: 8/7/2020 Machine: Bell 315SK	Hole Diameter: 600 mm Water Depth: Sheet: 1 of 1
SOIL PROFILE: TEST PIT 11	
FIGURE: A11	







TRIAL HOLE: 12 PROJECT: EXPANSION AND FORMALISATION OF WEGDRAAI COMMUNITY LOGGED BY: FJB SITE: ERVEN 1, 45 AND 47 OF WEGDRAAI CLIENT: IKHEIS MUNICIPALITY DATE LOGGED: 8/7/2020 LOCATION: 28°50'34,2" S 21°51'31,7" E		<i>Cedar Land Geotechnical Consult (Pty) Ltd</i> P O Box 607 Ceres 6835 Cell: 082 570 2767 Email: cedarland.frans@breede.co.za
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Depth (m)	Legend	PROFILE	SAMPLE			Remarks
			Number	Type	Symbol	
0.00		Ground Surface				NOTES: 1 Refusal of excavation at 800 mm on very dense hardpan calcrete.
		Abundant, clast supported, cobbles and boulders (± 400 mm in diameter) of <i>CALCRETE</i> in a matrix of dry, light brown, fine sand. Overall consistency is dense. Pedogenic deposits.				
0.20						
0.40		Dirty white mottled light grey stained light brown, very fine grained, very dense, hardpan <i>CALCRETE</i> . Pedogenic deposits.				
0.60			U9269	0,4-0,8		
0.80						
1.00						

Contractor: ALS Plant Hire Date Drilled: 8/7/2020 Machine: Bell 315SK	Hole Diameter: 600 mm Water Depth: Sheet: 1 of 1
SOIL PROFILE: TEST PIT 12	
FIGURE: A12	

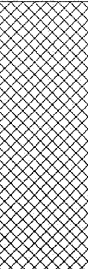
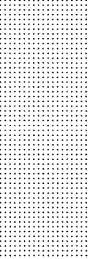







TRIAL HOLE: 13 PROJECT: EXPANSION AND FORMALISATION OF WEGDRAAI COMMUNITY LOGGED BY: FJB SITE: ERVEN 1, 45 AND 47 OF WEGDRAAI CLIENT: IKHEIS MUNICIPALITY DATE LOGGED: 8/7/2020 LOCATION: 28°50'19,3" S 21°51'31,2" E		<i>Cedar Land Geotechnical Consult (Pty) Ltd</i> P O Box 607 Ceres 6835 Cell: 082 570 2767 Email: cedarland.frans@breede.co.za
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Depth (m)	Legend	PROFILE	SAMPLE			Remarks
			Number	Type	Symbol	
0.00		Ground Surface				NOTES: 1 Refusal of excavation at 300 mm on very dense hardpan calcrete.
		Dry, light red brown, loose, intact, fine SAND and matrix supported, medium coarse, angular gravels of calcrete and angular to subangular, medium coarse, gravels of quartz. Colluvium.				
0.20		Dirty white, very fine grained, very dense, hardpan CALCRETE with pockets of dry, light red, fine sand. Pedogenic deposits.				
0.40						
0.60						
0.80						
1.00						

-  Water encountered
-  Water level
-  Bottom of hole
-  Approximate material change
-  Disturbed sample
-  Undisturbed sample



Contractor: ALS Plant Hire Date Drilled: 8/7/2020 Machine: Bell 315SK	Hole Diameter: 600 mm Water Depth: Sheet: 1 of 1
SOIL PROFILE: TEST PIT 13	
FIGURE: A13	

TRIAL HOLE: 14 PROJECT: EXPANSION AND FORMALISATION OF WEGDRAAI COMMUNITY LOGGED BY: FJB SITE: ERVEN 1, 45 AND 47 OF WEGDRAAI CLIENT: !KHEIS MUNICIPALITY DATE LOGGED: 8/7/2020 LOCATION: 28°50'30,8" S 21°51'36,6" E		Cedar Land Geotechnical Consult (Pty) Ltd P O Box 607 Ceres 6835 Cell: 082 570 2767 Email: cedarland.frans@breede.co.za
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Depth (m)	Legend	PROFILE	SAMPLE			Remarks
			Number	Type	Symbol	
0.00		Ground Surface				NOTES: 1 Refusal of excavation at 1000 mm on very dense hardpan calcrete.
0.20		FILL: consisting of dry, light brown sand containing ash, paper, bones, glass, plastic and decaying household matter. Overall consistency is very loose. Made ground.				
0.40		Slightly moist, light brown, loose, intact, fine SAND. Colluvium.				
0.60		Dirty white, very fine grained, very dense, hardpan CALCRETE with pockets of dry, light red, fine sand. Pedogenic deposits.				<div>  Water encountered  Water level  Bottom of hole  Approximate material change  Disturbed sample  Undisturbed sample </div>
0.80						
1.00						

Contractor: ALS Plant Hire Date Drilled: 8/7/2020 Machine: Bell 315SK	Hole Diameter: 600 mm Water Depth: Sheet: 1 of 1
SOIL PROFILE: TEST PIT 14	
FIGURE: A14	



TRIAL HOLE: 15		<i>Cedar Land Geotechnical Consult (Pty) Ltd</i> P O Box 607 Ceres 6835 Cell: 082 570 2767 Email: cedarland.frans@breede.co.za
PROJECT: EXPANSION AND FORMALISATION OF WEGDRAAI COMMUNITY		
LOGGED BY: FJB		
SITE: ERVEN 1, 45 AND 47 OF WEGDRAAI		
DATE LOGGED: 8/7/2020		
CLIENT: !KHEIS MUNICIPALITY		LOCATION: 28°50'24,3" S 21°51'54,9" E







Depth (m)	Legend	PROFILE	SAMPLE			Remarks
			Number	Type	Symbol	
0.00		Ground Surface				NOTES: 1 Refusal of excavation at 600 mm on very dense hardpan calcrete.
0.20		Abundant, clast supported, medium coarse to coarse, subrounded and rounded, GRAVELS of quartz and singular COBBLES of quartz in a matrix of dry, light red, fine sand. Overall consistency is medium dense. Colluvium.				
0.40		Pale light grey discoloured light green, very fine grained, very dense, hardpan CALCRETE. Pedogenic deposits.				
0.60						
0.80						
1.00						

- ∇ Water encountered
- ▼ Water level
- └ Bottom of hole
- Approximate material change
- Disturbed sample
- Undisturbed sample

Contractor: ALS Plant Hire Date Drilled: 8/7/2020 Machine: Bell 315SK	Hole Diameter: 600 mm Water Depth: Sheet: 1 of 1
SOIL PROFILE: TEST PIT 15	
FIGURE: A15	

TRIAL HOLE: 16 PROJECT: EXPANSION AND FORMALISATION OF WEGDRAAI COMMUNITY LOGGED BY: FJB SITE: ERVEN 1, 45 AND 47 OF WEGDRAAI CLIENT: !KHEIS MUNICIPALITY DATE LOGGED: 8/7/2020 LOCATION: 28°50'22,7" S 21°51'54,6" E	Cedar Land Geotechnical Consult (Pty) Ltd P O Box 607 Ceres 6835 Cell: 082 570 2767 Email: cedarland.frans@breede.co.za
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Depth (m)	Legend	PROFILE	SAMPLE			Remarks
			Number	Type	Symbol	
0.00		Ground Surface				NOTES: 1 Refusal of excavation at 300 mm on very dense hardpan calcrete.
		Abundant, clast supported, medium coarse to coarse, subrounded and rounded, GRAVELS of quartz and singular COBBLES of quartz in a matrix of dry, light red, fine sand. Overall consistency is medium dense. Colluvium.				
0.20		Pale light grey discoloured light brown, very fine grained, very dense, hardpan CALCRETE. Pedogenic deposits.	U9270	0-0,3		
0.40						
0.60						
0.80						
1.00						

-  Water encountered
-  Water level
-  Bottom of hole
-  Approximate material change
-  Disturbed sample
-  Undisturbed sample

Contractor: ALS Plant Hire Date Drilled: 8/7/2020 Machine: Bell 315SK	Hole Diameter: 600 mm Water Depth: Sheet: 1 of 1
SOIL PROFILE: TEST PIT 16	FIGURE: A16

TRIAL HOLE: 17

PROJECT: EXPANSION AND FORMALISATION OF WEGDRAAI COMMUNITY

LOGGED BY: FJB

SITE: ERVEN 1, 45 AND 47 OF WEGDRAAI

DATE LOGGED: 8/7/2020

CLIENT: !KHEIS MUNICIPALITY

LOCATION: 28°50'24,1" S 21°52'02,5" E

Cedar Land Geotechnical

Consult (Pty) Ltd

P O Box 607

Ceres

6835

Cell: 082 570 2767

Email:

cedarland.frans@breede.co.za

Depth (m)	Legend	PROFILE	SAMPLE			Remarks
			Number	Type	Symbol	
0.00		Ground Surface				NOTES: 1 Refusal of excavation at 900 mm on hard rock, schist.
		Abundant, clast supported, medium coarse to coarse, subrounded and rounded, <i>GRAVELS</i> of quartz and singular <i>COBBLES</i> of quartz in a matrix of dry, light red, fine sand. Overall consistency is medium dense. Colluvium.				
0.20		Dirty white, very fine grained, lenses of calcrete (± 100 mm thick) in a matrix of dry, light brown, fine sand, boulder <i>CALCRETE</i> . Overall consistency is dense. Pedogenic deposits.				
0.40						
0.60		Pale white mottled light green, intensely laminated, closely jointed, slightly weathered, soft rock becoming hard rock at depth, <i>quartz-muscovite SCHIST</i> . Discontinuities are closed, smooth and clean. Discontinuities are orientated at 40° with the horizontal.				
0.80			U9271	0,5-0,9		
1.00						

- Water encountered
- Water level
- Bottom of hole
- Approximate material change
- Disturbed sample
- Undisturbed sample

Contractor: ALS Plant Hire

Date Drilled: 8/7/2020

Machine: Bell 315SK

Hole Diameter: 600 mm










Water Depth:

Sheet: 1 of 1

SOIL PROFILE: TEST PIT 17



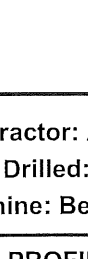
FIGURE: A17







TRIAL HOLE: 18		<i>Cedar Land Geotechnical Consult (Pty) Ltd</i> P O Box 607 Ceres 6835 Cell: 082 570 2767 Email: cedarland.frans@breede.co.za
PROJECT: EXPANSION AND FORMALISATION OF WEGDRAAI COMMUNITY		
LOGGED BY: FJB		
SITE: ERVEN 1, 45 AND 47 OF WEGDRAAI		
DATE LOGGED: 8/7/2020		
CLIENT: !KHEIS MUNICIPALITY		LOCATION: 28°50'21,2" S 21°52'01,4" E

Depth (m)	Legend	PROFILE	SAMPLE			Remarks
			Number	Type	Symbol	
0.00		Ground Surface Abundant, clast supported, medium coarse to coarse, subrounded and rounded, <i>GRAVELS</i> of quartz and singular <i>COBBLES</i> of quartz in a matrix of dry, light red, fine sand. Overall consistency is medium dense. Colluvium.				NOTES: 1 Refusal of excavation at 500 mm on hard rock, schist.
0.20		Dirty white, very fine grained, lenses of calcrete (± 100 mm thick) in a matrix of dry, light brown, fine sand, boulder <i>CALCRETE</i> . Overall consistency is dense. Pedogenic deposits.				
0.40		Pale white mottled light green, intensely laminated, closely jointed, slightly weathered, soft rock becoming hard rock at depth, <i>quartz-muscovite SCHIST</i> . Laminations are closed, smooth and clean. Joints open up to 1 cm and are filled with white, very fine grained, hard calcrete. Discontinuities are orientated at 40° with the horizontal.				
0.60						
0.80						<div style="font-size: small;">  Water encountered  Water level  Bottom of hole  Approximate material change  Disturbed sample  Undisturbed sample </div>
1.00						

Contractor: ALS Plant Hire Date Drilled: 8/7/2020 Machine: Bell 315SK	Hole Diameter: 600 mm Water Depth: Sheet: 1 of 1
SOIL PROFILE: TEST PIT 18	
FIGURE: A18	

TRIAL HOLE: 19 PROJECT: EXPANSION AND FORMALISATION OF WEGDRAAI COMMUNITY LOGGED BY: FJB SITE: ERVEN 1, 45 AND 47 OF WEGDRAAI CLIENT: !KHEIS MUNICIPALITY DATE LOGGED: 8/7/2020 LOCATION: 28°50'18,1" S 21°52'01,6" E		Cedar Land Geotechnical Consult (Pty) Ltd P O Box 607 Ceres 6835 Cell: 082 570 2767 Email: cedarland.frans@breede.co.za
--	--	--

Depth (m)	Legend	PROFILE	SAMPLE			Remarks
			Number	Type	Symbol	
0.00		Ground Surface				NOTES: 1 Refusal of excavation at 1000 mm on hard rock, schist.
		Abundant, clast supported, medium coarse to coarse, subrounded and rounded, GRAVELS of quartz and singular COBBLES of quartz in a matrix of dry, light red, fine sand. Overall consistency is medium dense. Colluvium.				
0.20		Abundant, clast supported, coarse, angular GRAVELS of schist in a matrix of slightly moist, dark red brown, fine sand. Overall consistency is dense. Residual quartz-muscovite schist.				
0.40						
0.60						
0.80		Pale white mottled light green, intensely laminated, closely jointed, slightly weathered, soft rock becoming hard rock at depth, quartz-muscovite SCHIST. Discontinuities are closed, smooth and clean. Discontinuities are orientated at 40° with the horizontal.				
1.00						

-  Water encountered
-  Water level
-  Bottom of hole
-  Approximate material change
-  Disturbed sample
-  Undisturbed sample

Contractor: ALS Plant Hire
 Date Drilled: 8/7/2020
 Machine: Bell 315SK

Hole Diameter: 600 mm
 Water Depth:
 Sheet: 1 of 1

SOIL PROFILE: TEST PIT 19

FIGURE: A19

TRIAL HOLE: 20 PROJECT: EXPANSION AND FORMALISATION OF WEGDRAAI COMMUNITY LOGGED BY: FJB SITE: ERVEN 1, 45 AND 47 OF WEGDRAAI CLIENT: !KHEIS MUNICIPALITY DATE LOGGED: 8/7/2020 LOCATION: 28°50'22,3" S 21°52'07,5" E		<i>Cedar Land Geotechnical Consult (Pty) Ltd</i> P O Box 607 Ceres 6835 Cell: 082 570 2767 Email: cedarland.frans@breede.co.za
--	--	---

Depth (m)	Legend	PROFILE	SAMPLE			Remarks
			Number	Type	Symbol	
0.00		Ground Surface				NOTES: 1 Refusal of excavation at 500 mm on very dense hardpan calcrete.
0.20		Dry, light red brown, loose, intact, fine SAND and matrix supported, medium coarse, angular gravels of calcrete and angular to subangular, medium coarse, gravels of quartz. Colluvium.				
0.40		Dirty white, very fine grained, very dense, hardpan CALCRETE with pockets of dry, light red, fine sand. Pedogenic deposits.				
0.60						
0.80						
1.00						

Contractor: ALS Plant Hire Date Drilled: 8/7/2020 Machine: Bell 315SK	Hole Diameter: 600 mm Water Depth: Sheet: 1 of 1
SOIL PROFILE: TEST PIT 20	
FIGURE: A20	

TRIAL HOLE: 21 PROJECT: EXPANSION AND FORMALISATION OF WEGDRAAI COMMUNITY LOGGED BY: FJB SITE: ERVEN 1, 45 AND 47 OF WEGDRAAI CLIENT: !KHEIS MUNICIPALITY DATE LOGGED: 8/7/2020 LOCATION: 28°50'19,4" S 21°52'15,2" E		Cedar Land Geotechnical Consult (Pty) Ltd P O Box 607 Ceres 6835 Cell: 082 570 2767 Email: cedarland.frans@breede.co.za
--	--	--

Depth (m)	Legend	PROFILE	SAMPLE			Remarks
			Number	Type	Symbol	
0.00		Ground Surface				NOTES: 1 Refusal of excavation at 800 mm on hard rock, schist.
0.20		Abundant, clast supported, medium coarse to coarse, subrounded and rounded, <i>GRAVELS</i> of quartz and singular <i>COBBLES</i> of quartz in a matrix of dry, light red, fine sand. Overall consistency is medium dense. Colluvium.	U9272	0-0,4		
0.40		Pale white mottled light green, intensely laminated, closely jointed, slightly weathered, soft rock becoming hard rock at depth, <i>quartz-muscovite SCHIST</i> . Discontinuities are closed, smooth and clean. Discontinuities are horizontally orientated.				
0.60						
0.80						
1.00						Water encountered Water level Bottom of hole Approximate material change Disturbed sample Undisturbed sample

Contractor: ALS Plant Hire Date Drilled: 8/7/2020 Machine: Bell 315SK	Hole Diameter: 600 mm Water Depth: Sheet: 1 of 1
SOIL PROFILE: TEST PIT 21	
FIGURE: A21	

TRIAL HOLE: 22 PROJECT: EXPANSION AND FORMALISATION OF WEGDRAAI COMMUNITY LOGGED BY: FJB SITE: ERVEN 1, 45 AND 47 OF WEGDRAAI CLIENT: !KHEIS MUNICIPALITY DATE LOGGED: 8/7/2020 LOCATION: 28°50'16,4" S 21°52'20,6" E		<i>Cedar Land Geotechnical Consult (Pty) Ltd</i> P O Box 607 Ceres 6835 Cell: 082 570 2767 Email: cedarland.frans@breede.co.za
--	--	---

Depth (m)	Legend	PROFILE	SAMPLE			Remarks
			Number	Type	Symbol	
0.00		Ground Surface				NOTES: 1 Refusal of excavation at 700 mm on hard rock, schist.
0.20		Dry, light red brown, loose, intact, fine SAND and matrix supported, medium coarse, angular gravels of calcrete and angular to subangular, medium coarse, gravels of quartz. Colluvium.				
0.40		Dark grey green, very closely jointed, very intensely laminated, very fine grained, slightly weathered, soft rock becoming hard rock with depth, quartz-muscovite SCHIST with lenses of very hard, light grey quartz. Discontinuities are open, smooth and filled with white, powdery calcrete. Discontinuities are orientated at 45° with the horizontal.				
0.60						
0.80						
1.00						

- ▽ Water encountered
- ┆ Water level
- ┆ Bottom of hole
- Approximate material change
- Disturbed sample
- Undisturbed sample

Contractor: ALS Plant Hire Date Drilled: 8/7/2020 Machine: Bell 315SK	Hole Diameter: 600 mm Water Depth: Sheet: 1 of 1
SOIL PROFILE: TEST PIT 22	
FIGURE: A22	

TRIAL HOLE: 23

PROJECT: EXPANSION AND FORMALISATION OF WEGDRAAI COMMUNITY

LOGGED BY: FJB

SITE: ERVEN 1, 45 AND 47 OF WEGDRAAI

DATE LOGGED: 8/7/2020

CLIENT: !KHEIS MUNICIPALITY

LOCATION: 28°50'13,1" S 21°52'19,0" E

Cedar Land Geotechnical

Consult (Pty) Ltd

P O Box 607

Ceres

6835

Cell: 082 570 2767

Email:

cedarland.frans@breede.co.za

Depth (m)	Legend	PROFILE	SAMPLE			Remarks
			Number	Type	Symbol	
0.00		Ground Surface				NOTES: 1 Refusal of excavation at 400 mm on very dense hardpan calcrete.
		Dry, light red brown, loose, intact, fine SAND and matrix supported, medium coarse, angular gravels of calcrete and angular to subangular, medium coarse, gravels of quartz. Colluvium.				
0.20		Dirty white, very fine grained, very dense, hardpan CALCRETE with pockets of dry, light brown, fine sand. Pedogenic deposits.	U9273	0,1-0,4		
0.40						
0.60						
0.80						
1.00						

- Water encountered
- Water level
- Bottom of hole
- Approximate material change
- Disturbed sample
- Undisturbed sample

Contractor: ALS Plant Hire

Date Drilled: 8/7/2020

Machine: Bell 315SK

Hole Diameter: 600 mm

Water Depth:

Sheet: 1 of 1

SOIL PROFILE: TEST PIT 23

FIGURE: A23

TRIAL HOLE: 24

PROJECT: EXPANSION AND FORMALISATION OF WEGDRAAI COMMUNITY

LOGGED BY: FJB

SITE: ERVEN 1, 45 AND 47 OF WEGDRAAI

DATE LOGGED: 8/7/2020

CLIENT: !KHEIS MUNICIPALITY

LOCATION: 28°50'09,7" S 21°52'16,3" E

Cedar Land Geotechnical

Consult (Pty) Ltd

P O Box 607




Ceres







6835

Cell: 082 570 2767

Email:

cedarland.frans@breede.co.za

Depth (m)	Legend	PROFILE	SAMPLE			Remarks
			Number	Type	Symbol	
0.00		Ground Surface				NOTES: 1 Refusal of excavation at 500 mm on very dense hardpan calcrete.
0.20		Dirty white, very fine grained, dense becoming very dense with depth, hardpan CALCRETE with pockets of dry, light brown, fine sand. Pedogenic deposits.				
0.40						
0.60						
0.80						
1.00						

-  Water encountered
-  Water level
-  Bottom of hole
-  Approximate material change
-  Disturbed sample
-  Undisturbed sample

Contractor: ALS Plant Hire

Date Drilled: 8/7/2020

Machine: Bell 315SK

Hole Diameter: 600 mm

Water Depth:

Sheet: 1 of 1

SOIL PROFILE: TEST PIT 24








FIGURE: A24

TRIAL HOLE: 25 PROJECT: EXPANSION AND FORMALISATION OF WEGDRAAI COMMUNITY LOGGED BY: FJB SITE: ERVEN 1, 45 AND 47 OF WEGDRAAI CLIENT: !KHEIS MUNICIPALITY DATE LOGGED: 8/7/2020 LOCATION: 28°50'06,1" S 21°52'10,6" E		Cedar Land Geotechnical Consult (Pty) Ltd P O Box 607 Ceres 6835 Cell: 082 570 2767 Email: cedarland.frans@breede.co.za
--	--	--

Depth (m)	Legend	PROFILE	SAMPLE			Remarks
			Number	Type	Symbol	
0.00		Ground Surface				NOTES: 1 Refusal of excavation at 700 mm on very dense hardpan calcrete.
0.20		Dry, light red brown, loose, intact, fine SAND and matrix supported, medium coarse, angular gravels of calcrete and angular to subangular, medium coarse, gravels of quartz. Colluvium.				
0.40		Dirty white, very fine grained, very dense, hardpan CALCRETE with pockets of dry, light brown, fine sand. Pedogenic deposits.				
0.60						
0.80						
1.00						

Contractor: ALS Plant Hire Date Drilled: 8/7/2020 Machine: Bell 315SK	Hole Diameter: 600 mm Water Depth: Sheet: 1 of 1
SOIL PROFILE: TEST PIT 25	
FIGURE: A25	

TRIAL HOLE: 26 PROJECT: EXPANSION AND FORMALISATION OF WEGDRAAI COMMUNITY LOGGED BY: FJB SITE: ERVEN 1, 45 AND 47 OF WEGDRAAI CLIENT: !KHEIS MUNICIPALITY DATE LOGGED: 8/7/2020 LOCATION: 28°50'09,1" S 21°52'09,5" E		Cedar Land Geotechnical Consult (Pty) Ltd P O Box 607 Ceres 6835 Cell: 082 570 2767 Email: cedarland.frans@breede.co.za
--	--	--

Depth (m)	Legend	PROFILE	SAMPLE			Remarks
			Number	Type	Symbol	
0.00		Ground Surface				NOTES: 1 Refusal of excavation at 600 mm on very dense hardpan calcrete.
		Dry, light red brown, loose, intact, fine SAND and matrix supported, medium coarse, angular gravels of calcrete and angular to subangular, medium coarse, gravels of quartz. Colluvium.				
0.20		Dirty white, very fine grained, very dense, hardpan CALCRETE with pockets of dry, light brown, fine sand. Pedogenic deposits.				
0.40			U9274	0,2-0,6		
0.60						<div>  Water encountered  Water level  Bottom of hole  Approximate material change  Disturbed sample  Undisturbed sample </div>
0.80						
1.00						

Contractor: ALS Plant Hire Date Drilled: 8/7/2020 Machine: Bell 315SK	Hole Diameter: 600 mm Water Depth: Sheet: 1 of 1
SOIL PROFILE: TEST PIT 26	
FIGURE: A26	



TRIAL HOLE: 28 PROJECT: EXPANSION AND FORMALISATION OF WEGDRAAI COMMUNITY LOGGED BY: FJB SITE: ERVEN 1, 45 AND 47 OF WEGDRAAI CLIENT: !KHEIS MUNICIPALITY DATE LOGGED: 8/7/2020 LOCATION: 28°50'11,6" S 21°51'51,0" E		Cedar Land Geotechnical Consult (Pty) Ltd P O Box 607 Ceres 6835 Cell: 082 570 2767 Email: cedarland.frans@breede.co.za
--	--	--







Depth (m)	Legend	PROFILE	SAMPLE			Remarks
			Number	Type	Symbol	
0.00		Ground Surface				NOTES: 1 Refusal of excavation at 500 mm on very dense hardpan calcrete.
0.20		Dry, light red brown, loose, intact, fine SAND and matrix supported, medium coarse, angular gravels of calcrete and angular to subangular, medium coarse, gravels of quartz. Colluvium.				
0.40		Dirty white, very fine grained, very dense, hardpan CALCRETE with pockets of dry, light red, fine sand. Pedogenic deposits.				
0.60						
0.80						
1.00						

- ∇ Water encountered
- ↓ Water level
- └ Bottom of hole
- Approximate material change
- Disturbed sample
- Undisturbed sample

Contractor: ALS Plant Hire Date Drilled: 8/7/2020 Machine: Bell 315SK	Hole Diameter: 600 mm Water Depth: Sheet: 1 of 1
SOIL PROFILE: TEST PIT 28	
FIGURE: A28	

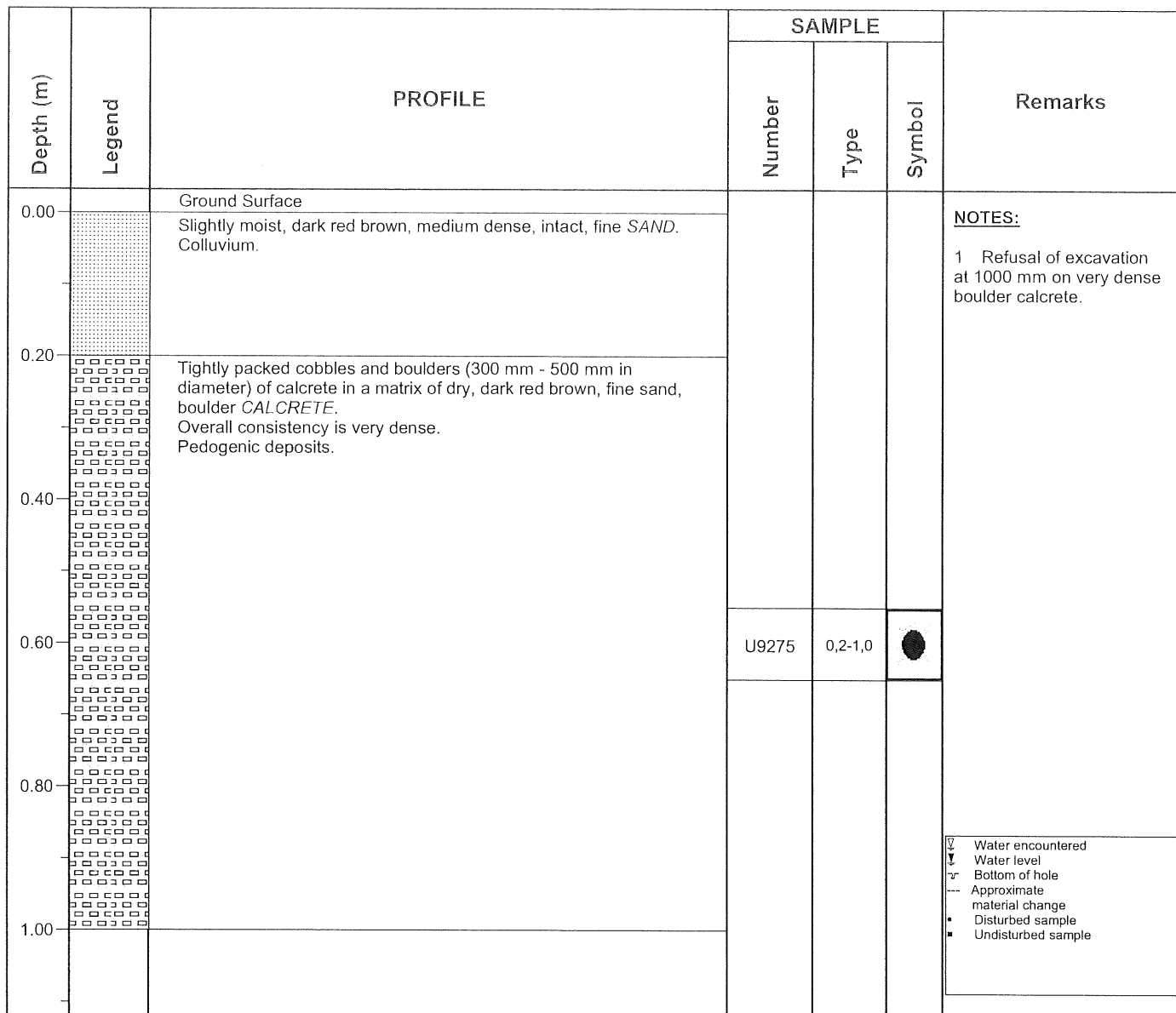
TRIAL HOLE: 29**PROJECT:** EXPANSION AND FORMALISATION OF WEGDRAAI COMMUNITY**LOGGED BY:** FJB**SITE:** ERVEN 1, 45 AND 47 OF WEGDRAAI**DATE LOGGED:** 8/7/2020**CLIENT:** !KHEIS MUNICIPALITY**LOCATION:** 28°50'13,1" S 21°51'45,6" E*Cedar Land Geotechnical**Consult (Pty) Ltd***P O Box 607****Ceres****6835****Cell: 082 570 2767****Email:****cedarland.frans@breede.co.za**

Depth (m)	Legend	PROFILE	SAMPLE			Remarks
			Number	Type	Symbol	
0.00		Ground Surface				NOTES: 1 Refusal of excavation at 300 mm on very dense hardpan calcrete.
		Dry, light red brown, loose, intact, fine SAND and matrix supported, medium coarse, angular gravels of calcrete and angular to subangular, medium coarse, gravels of quartz. Colluvium.				
0.20		Dirty white, very fine grained, very dense, hardpan CALCRETE with pockets of dry, light red, fine sand. Pedogenic deposits.				
0.40						
0.60						
0.80						
1.00						

-  Water encountered
-  Water level
-  Bottom of hole
-  Approximate material change
-  Disturbed sample
-  Undisturbed sample

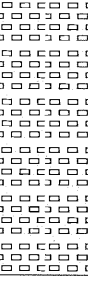

Contractor: ALS Plant Hire**Date Drilled:** 8/7/2020**Machine:** Bell 315SK**Hole Diameter:** 600 mm**Water Depth:****Sheet:** 1 of 1**SOIL PROFILE:** TEST PIT 29**FIGURE:** A29

TRIAL HOLE: 30 PROJECT: EXPANSION AND FORMALISATION OF WEGDRAAI COMMUNITY LOGGED BY: FJB SITE: ERVEN 1, 45 AND 47 OF WEGDRAAI CLIENT: !KHEIS MUNICIPALITY DATE LOGGED: 8/7/2020 LOCATION: 28°50'18,5" S 21°51'46,1" E		Cedar Land Geotechnical Consult (Pty) Ltd P O Box 607 Ceres 6835 Cell: 082 570 2767 Email: cedarland.frans@breede.co.za
--	--	--



Contractor: ALS Plant Hire Date Drilled: 8/7/2020 Machine: Bell 315SK	Hole Diameter: 600 mm Water Depth: Sheet: 1 of 1
SOIL PROFILE: TEST PIT 30	
FIGURE: A30	

TRIAL HOLE: 31 PROJECT: EXPANSION AND FORMALISATION OF WEGDRAAI COMMUNITY LOGGED BY: FJB SITE: ERVEN 1, 45 AND 47 OF WEGDRAAI CLIENT: !KHEIS MUNICIPALITY DATE LOGGED: 8/7/2020 LOCATION: 28°50'16,0" S 21°51'37,8" E	<i>Cedar Land Geotechnical Consult (Pty) Ltd</i> P O Box 607 Ceres 6835 Cell: 082 570 2767 Email: cedarland.frans@breede.co.za
--	--

Depth (m)	Legend	PROFILE	SAMPLE			Remarks
			Number	Type	Symbol	
0.00		Ground Surface				NOTES: 1 Refusal of excavation at 300 mm on very dense hardpan calcrete.
0.20		Dirty white, very fine grained, very dense, hardpan <i>CALCRETE</i> with pockets of dry, light red, fine sand. Pedogenic deposits.	U9276	0-0,3		
0.40						
0.60						
0.80						
1.00						

Contractor: ALS Plant Hire Date Drilled: 8/7/2020 Machine: Bell 315SK	Hole Diameter: 600 mm Water Depth: Sheet: 1 of 1
SOIL PROFILE: TEST PIT 31	
FIGURE: A31	

**GEOTECHNICAL CONDITIONS ON ERVEN 1, 45 AND
47 OF WEGDRAAI: A REPORT FOR THE EXPANSION
AND FORMALISATION OF WEGDRAAI COMMUNITY**

2020/J09/MCP_01

ADDENDUM B: RESULTS OF MATERIALS TESTING

Job Request No.: RU3525
 Ceder Land Geotechnical Consult (Pty) Ltd
 PO Box 607
 Ceres
 6835
 Attention : Frans Breylenbach

Roadlab Germiston
 207 Rietfontein Road Germiston
 1401
 Tel: 011 828 0279 Fax: 011 828 0279
 Email: info@roadlab.co.za
 Web: www.roadlab.co.za

Date Reported : 2020-08-12

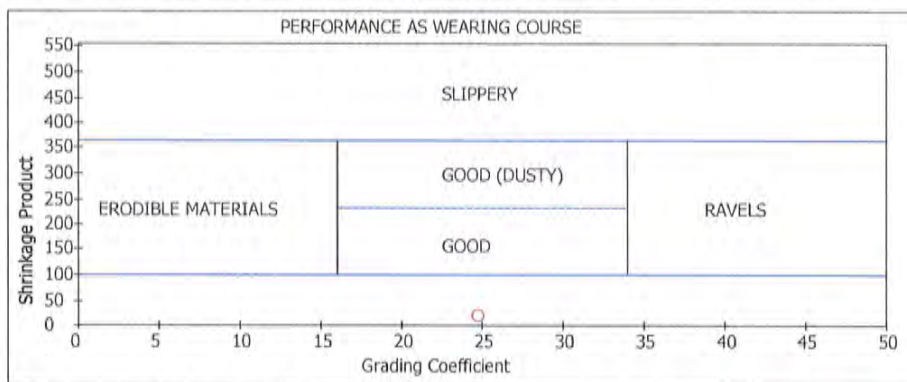
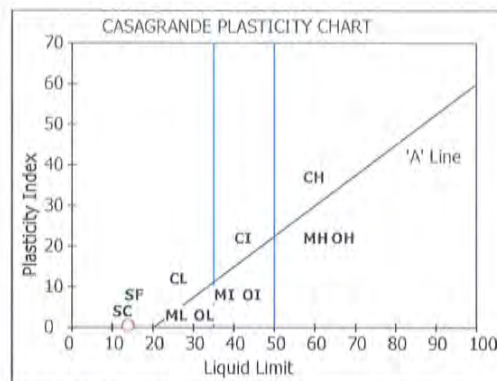
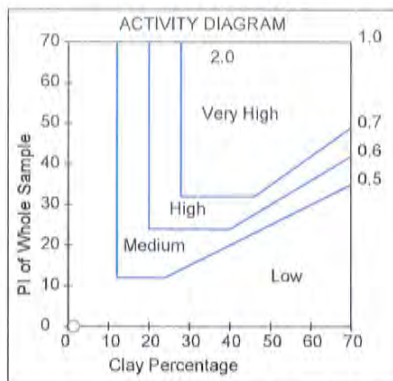
Project : Wegdraai Infrastructure Upgrade

Foundation Indicator Test Report SANS 3001 - GR1 / GR3 / GR10

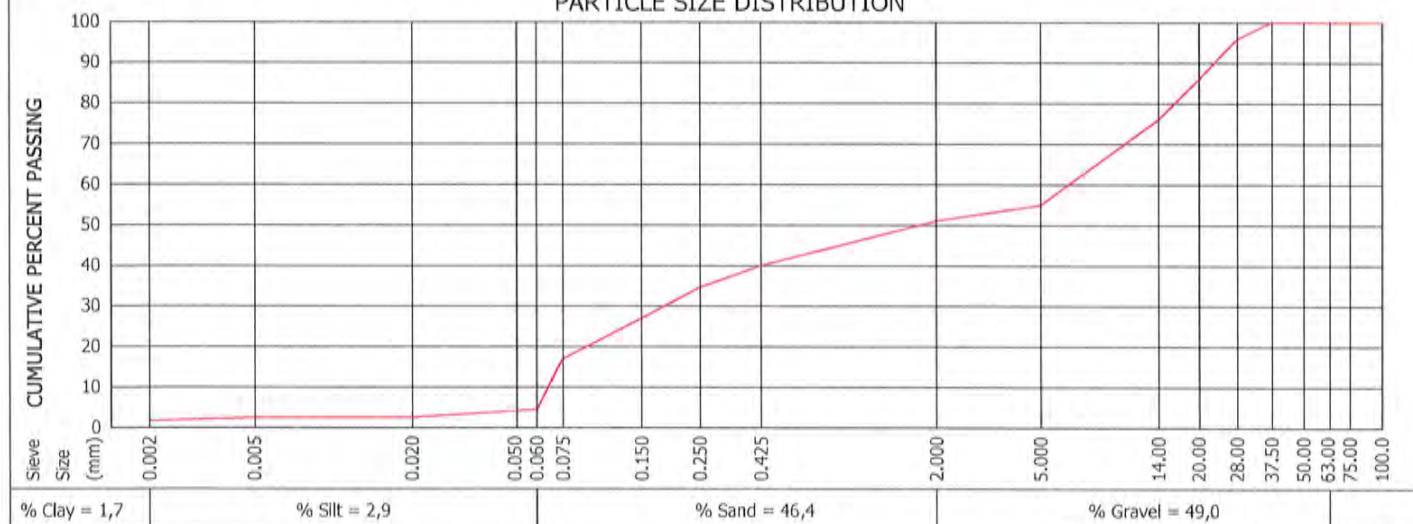
Sample No. : U9267
 Position : TP 1
 Layer Type : 0-300mm
 Sample Colour : Orange Brown Gravel
 Sample Type : Mix Quartzstone

Sieve Size(mm)	% Passing	Soil Mortar	
100.0	100	2.000 - 0.425	22
75.00	100	0.425 - 0.250	10
63.00	100	0.250 - 0.150	15
50.00	100	0.150 - 0.075	20
37.50	100	< 0.075	33
28.00	96	Effective Size	0,067
20.00	86	Uniformity Coefficient	106,6
14.00	76	Curvature Coefficient	0,1
5.000	55	Oversize Index	0,0
2.000	51	Shrinkage Product	20,0
0.425	40	Grading Coefficient	24,8
0.250	35	Grading Modulus	1,90
0.150	27	Atterberg Limits	Liquid Limit
0.075	17		Plasticity Index
0.060	4,6		Linear Shrinkage
0.050	4,1		PI < 0.075
0.020	2,6	Unified Soil Classification	
0.005	2,5	US Highway Classification	
0.002	1,7		

D10= 0,067 D30= 0,189 D60= 7,143



PARTICLE SIZE DISTRIBUTION



Deviation from Test Method :
 Remarks and Notes :

Opinions and interpretations are not included in our scope of works. (T0296)
 The samples were subjected to analysis according to (SANS)(TMH5)(DOT)(ASTM).
 The test results reported relate to the samples tested.
 Further use of the above information is not the responsibility or liability of Roadlab.
 Documents may only be reproduced or published in their full context.
 Report compiled by : Juraine Okkies

Job Request No.: RU3525
Ceder Land Geotechnical Consult (Pty) Ltd
PO Box 607
Ceres
6835
Attention : Frans Breytenbach

Date Reported : 2020-08-24

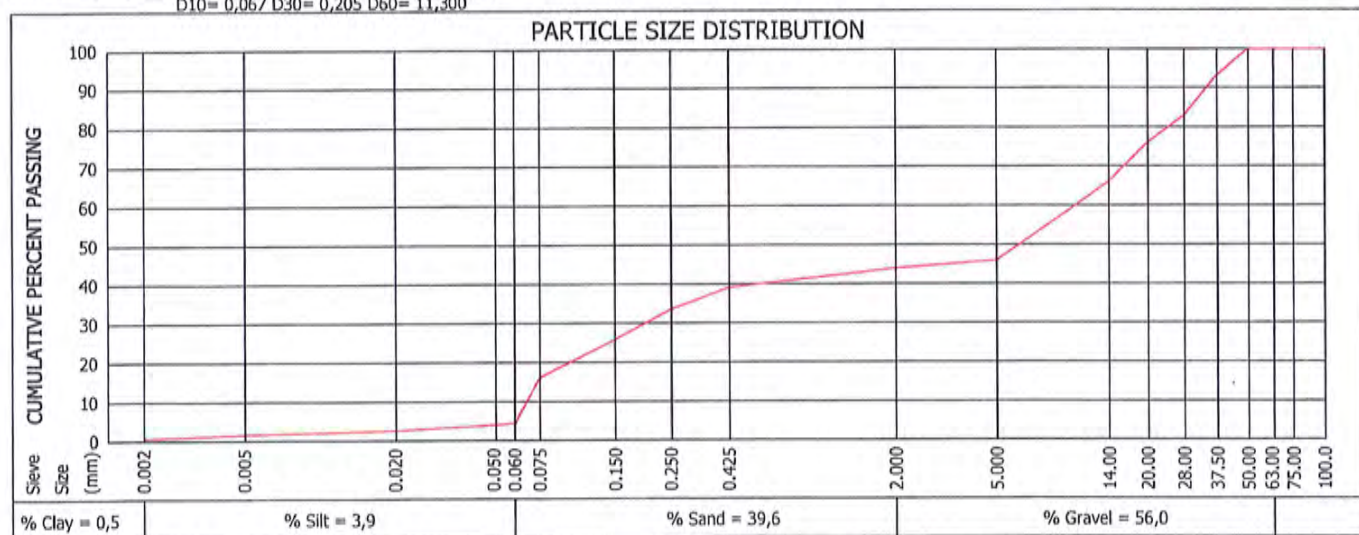
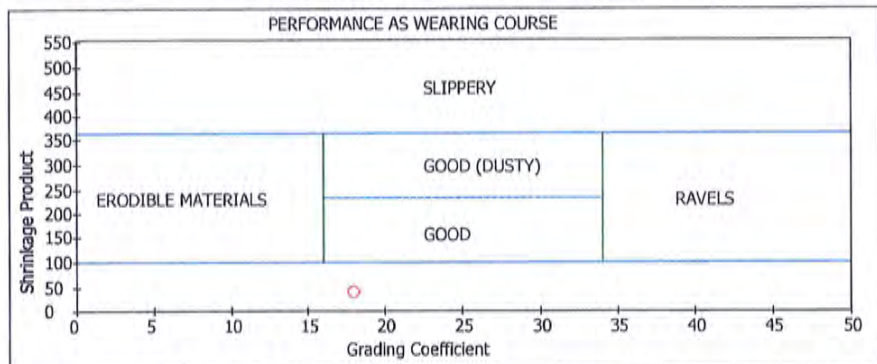
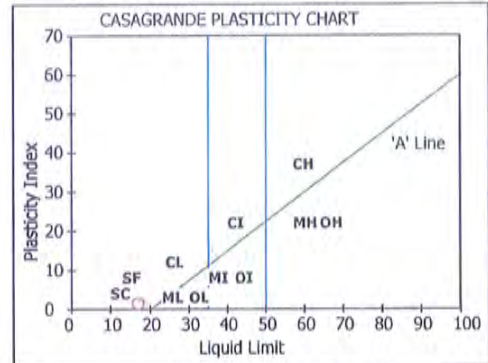
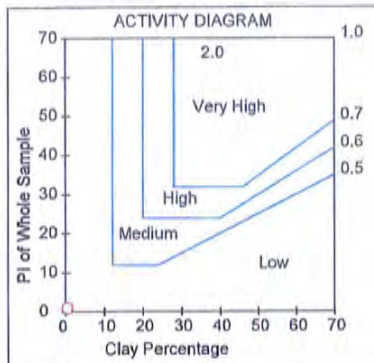
Project : Wegdraai Infrastructure Upgrade

Foundation Indicator Test Report SANS 3001 - GR1 / GR3 / GR10

Sample No.	: U9268
Position	: TP 6
Layer Type	: 0-400mm
Sample Colour	: Orange Brown Gravel
Sample Type	: Mix Calcrete + Quart

Sieve Size(mm)	% Passing	Soil Mortar		
100.0	100	2.000 - 0.425	11	
75.00	100	0.425 - 0.250	13	
63.00	100	0.250 - 0.150	17	
50.00	100	0.150 - 0.075	22	
37.50	93	< 0.075	37	
28.00	83	Effective Size	0,067	
20.00	76	Uniformity Coefficient	168,7	
14.00	66	Curvature Coefficient	0,1	
5.000	46	Oversize Index	7,0	
2.000	44	Shrinkage Product	39,0	
0.425	39	Grading Coefficient	17,9	
0.250	33	Grading Modulus	2,00	
0.150	26	Atterberg Limits	Liquid Limit	17
0.075	16		Plasticity Index	2,0
0.060	4,4		Linear Shrinkage	1,0
0.050	3,9		PI < 0.075	
0.020	2,5	Unified Soil Classification	GC	
0.005	1,5	US Highway Classification	A-1-b(0)	
0.002	0,5			

D10= 0,067 D30= 0,205 D60= 11,300



Deviation from Test Method :
Remarks and Notes : Chemistry: pH = 7.64 [SANS 5854] & Conductivity = 0.13 S/m [SANS 6240]

Opinions and interpretations are not included in our scope of works. (T0296)
The samples were subjected to analysis according to (SANS)(TMH5)(DOT)(ASTM).
The test results reported relate to the samples tested.
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Report compiled by : Juraine Okkies

Job Request No.: RU3525
Ceder Land Geotechnical Consult (Pty) Ltd
PO Box 607
Ceres
6835
Attention : Frans Breytenbach

Date Reported : 2020-07-17

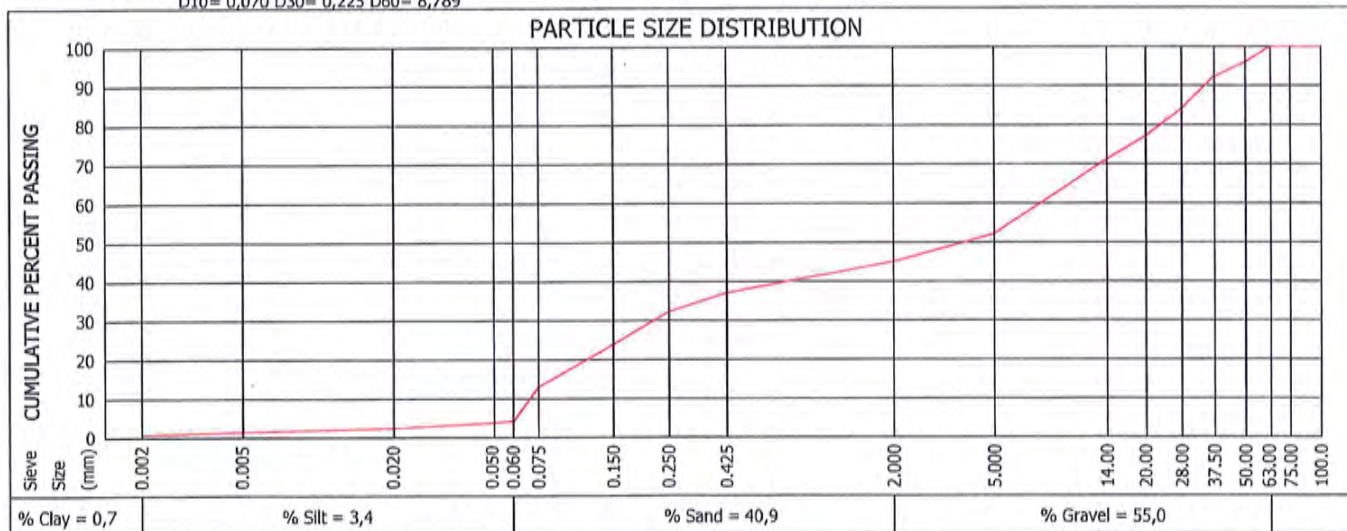
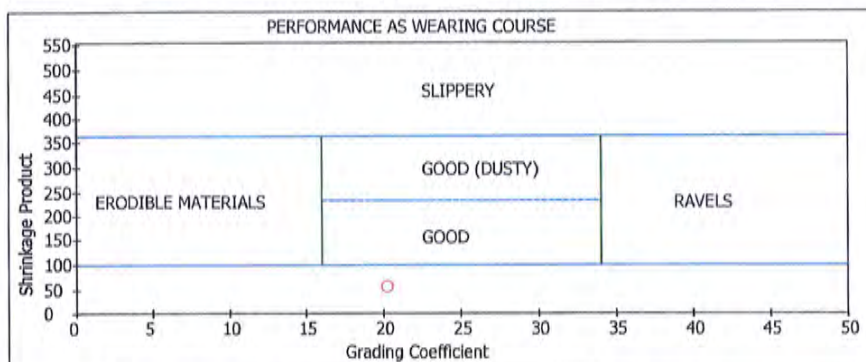
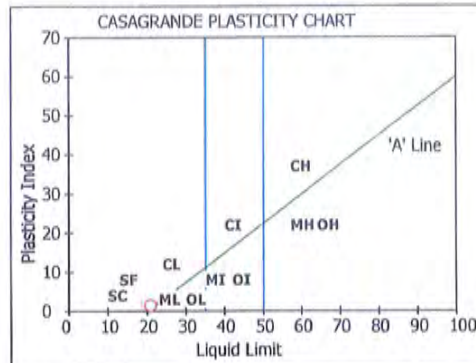
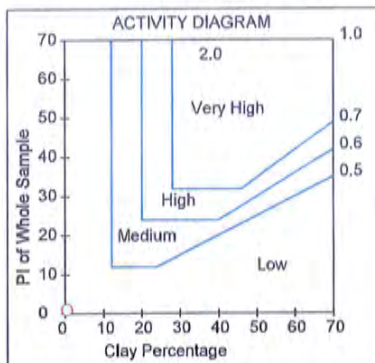
Project : Wegdraai Infrastructure Upgrade

Foundation Indicator Test Report SANS 3001 - GR1 / GR3 / GR10

Sample No. : U9269
Position : TP 12
Layer Type : 400-800mm
Sample Colour : Brown
Sample Type : Mix Calcretestone

Sieve Size (mm)	% Passing	Soil Mortar	2.000 - 0.425	17
100.0	100		0.425 - 0.250	12
75.00	100		0.250 - 0.150	19
63.00	100		0.150 - 0.075	24
50.00	96		< 0.075	29
37.50	92	Effective Size		0,070
28.00	84	Uniformity Coefficient		125,6
20.00	77	Curvature Coefficient		0,1
14.00	71	Oversize Index		4,0
5.000	52	Shrinkage Product		55,5
2.000	45	Grading Coefficient		20,3
0.425	37	Grading Modulus		2,10
0.250	32	Atterberg Limits	Liquid Limit	21
0.150	24		Plasticity Index	2.0
0.075	13		Linear Shrinkage	1.5
0.060	4,1		PI < 0.075	
0.050	3,7	Unified Soil Classification		SC
0.020	2,3	US Highway Classification		A-1-b(0)
0.005	1,4			
0.002	0,7			

D₁₀ = 0,070 D₃₀ = 0,225 D₆₀ = 8,789



Deviation from Test Method :
Remarks and Notes :

Opinions and interpretations are not included in our scope of works. (T0296)
The samples were subjected to analysis according to (SANS)(TMH5)(DOT)(ASTM).
The test results reported relate to the samples tested.
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Report compiled by : Juraine Okkies

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D Juckers
Technical Signatory

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Job Request No.: RU3525
Ceder Land Geotechnical Consult (Pty) Ltd
PO Box 607
Ceres
6835

Date Reported : 2020-07-24

Project : Wegdraai Infrastructure Upgrade

Attention : Frans Breytenbach

Determination of the California Bearing Ratio Test Report SANS 3001 - GR1 / GR2 / GR10 / GR20 / GR30 / GR40 / PR5

SAMPLE INFORMATION AND PROPERTIES

SAMPLE NO.	U9269		
HOLE NO./ Km / CHAINAGE	TP12		
ROAD NO./ NAME Line 1	S28° 50' 24,1"		
ROAD NO./ NAME Line 2	E21° 52' 02,5"		
LAYER TESTED/SAMPLED	400-800mm		
SAMPLE DEPTH	400-800mm		
DATE SAMPLED	2020-07-08		
COLOUR OF SAMPLE	Brown		
TYPE OF SAMPLE	Mix Calcrete Stone		

SIEVE ANALYSIS - % PASSING SIEVES *(SANS 3001-GR1:2010, SANS 3001-GR2:2010)

SIEVE ANALYSIS (GR 1) % PASSING	100.0 mm				
	75.0 mm				
	63.0 mm	100			
	50.0 mm	96			
	37.5 mm	92			
	28.0 mm	84			
	20.0 mm	77			
	14.0 mm	71			
	5.0 mm	52			
	2.0 mm	45			
	0.425 mm	37			
	0.075 mm	13			
GM %		2,1			

SOIL MORTAR ANALYSIS (SANS 3001-PR5:2011)

COARSE SAND	2.000 - 0.425	17		
COARSE FINE SAND	0.425 - 0.250	12		
MEDIUM FINE SAND	0.250 - 0.150	19		
FINE FINE SAND	0.150 - 0.075	24		
SILT CLAY	0.075	29		

ATTERBERG LIMITS ANALYSIS - *(SANS 3001-GR10:2010)

ATTERBERG LIMITS (%) SANS GR10,GR11	LIQUID LIMIT	21		
	PLASTICITY INDEX	1,7		
	LINEAR SHRINKAGE	1,5		
CLASSIFICATION	H.R.B.	A-1-b(0)		
	COLTO	G5		
	TRH 14	G5		

CALIFORNIA BEARING RATIO - *(SANS 3001-GR30:2010, SANS 3001-GR40:2010)

SANS GR30 MAX. DRY DENSITY	OMC %	10,5		
	MDD (kg/m³)	1922		
	COMP MC %	10,5		
SWELL % @	MOD NRB PRO	0,00 0,01 0,02		
	100 %	81		
	98 %	70		
C.B.R. SANS GR40	97 %	64		
	95 %	55		
	93 %	47		
	90 %	38		

STABILISER IN LAB	Not Applicable		
TEST TYPE	CBR		
SAMPLING METHOD	TMH 5		
WEATHER WHEN SAMPLED	Cold		

Deviation from Test Method :
Remarks and Notes :

Opinions and interpretations are not included in our scope of works. (T0296)
The samples were subjected to analysis according to (SANS)(TMH5)(DOT)(ASTM).
The test results reported relate to the samples tested.
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Report compiled by : Juraine Okkies



Job Request No.: RU3525
Ceder Land Geotechnical Consult (Pty) Ltd
PO Box 607
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Attention : Frans Breytenbach

Roadlab Germiston
207 Rietfontein Road Germiston
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Tel: 011 828 0279 Fax: 011 828 0279
Email: info@roadlab.co.za
Web: www.roadlab.co.za

Date Reported : 2020-07-17

Project : Wegdraai Infrastructure Upgrade

Determination Maximum Dry Density & Optimum Moisture Content Test Report

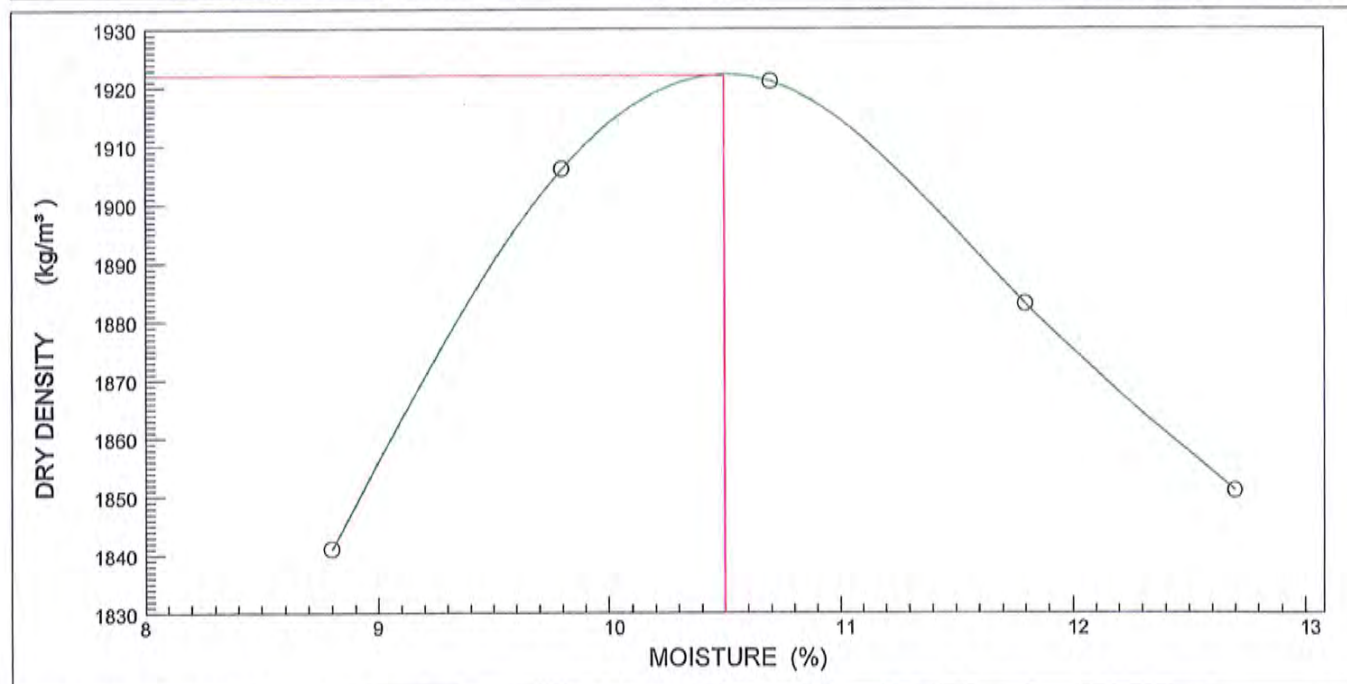
SANS 3001 - GR20/GR30

SAMPLE NO.	U9269
CONTAINER FOR SAMPLING	Black Bags
SIZE / APPROX. MASS OF SAMPLE	100kg
MOISTURE CONDITION OF SAMPLE	Moist
LAYER TESTED / SAMPLED FROM	400-800mm
MATERIAL DESCRIPTION	Mix Calcretestone
HOLE NO./ km / CHAINAGE	TP12
ROAD NO.	Not Specified
DATE RECEIVED	2020-07-09
DATE SAMPLED	2020-07-08
CLIENT MARKING	S28° 50' 24,1"; E21° 52' 02,5"
COLOUR AND TYPE	Brown Gravel

POINT NO.	1	2	3	4	5			
DRY DENSITY (kg/m³)	1841	1906	1921	1883	1851			
MOISTURE (%)	8,8	9,8	10,7	11,8	12,7			

MAXIMUM DRY DENSITY (kg/m³) : 1922

OPTIMUM MOISTURE CONTENT (%) : 10,5



Deviation from Test Method :

Remarks and Notes :

Opinions and interpretations are not included in our scope of works. (T0296)
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The test results reported relate to the samples tested.
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Report compiled by : Juraine Okkies

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Job Request No.: RU3525
Ceder Land Geotechnical Consult (Pty) Ltd
PO Box 607
Ceres
6835
Attention : Frans Breytenbach

Date Reported : 2020-08-06

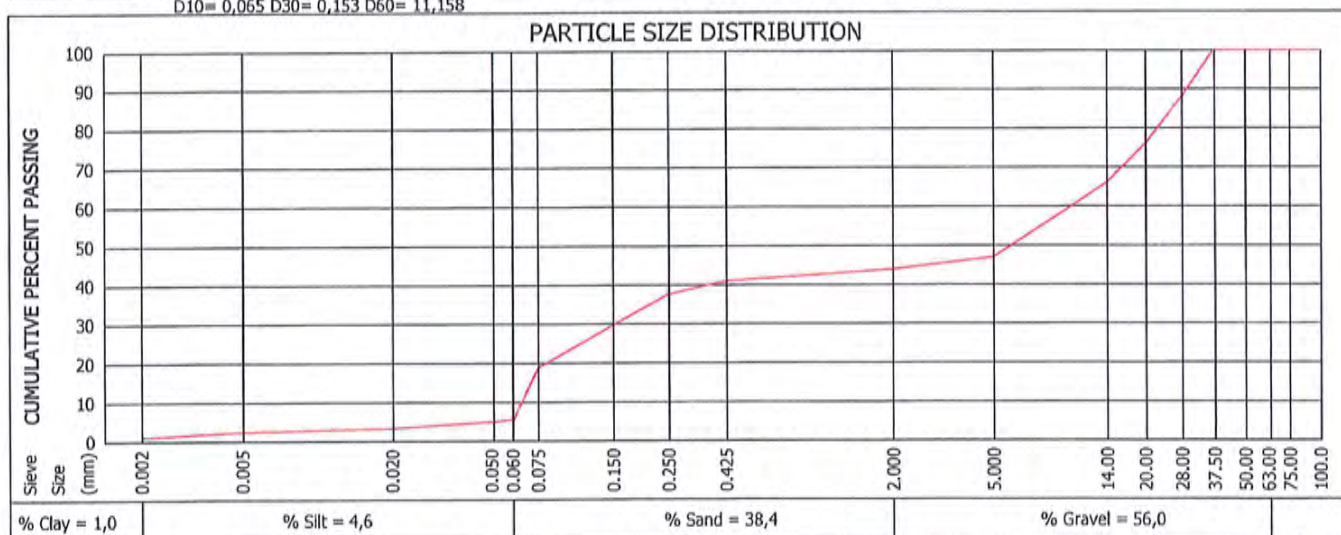
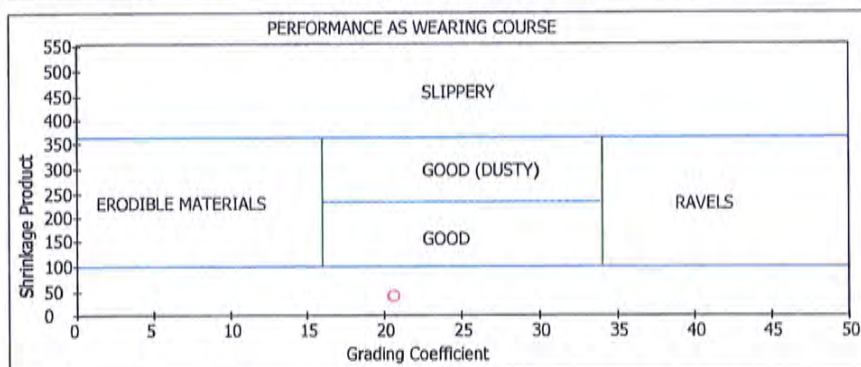
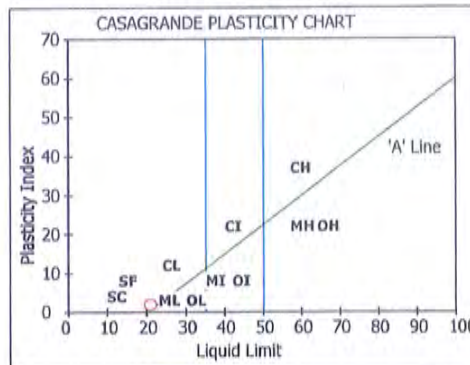
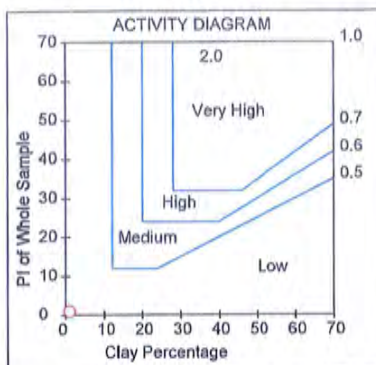
Project : Wegdraai Infrastructure Upgrade

Foundation Indicator Test Report SANS 3001 - GR1 / GR3 / GR10

Sample No. : U9270
Position : TP 16
Layer Type : 0-300mm
Sample Colour : Light Red & Brown
Sample Type : Fine Sand & Calcrete

Sieve Size(mm)	% Passing	Soil Mortar	2.000 - 0.425	7
100.0	100		0.425 - 0.250	8
75.00	100		0.250 - 0.150	18
63.00	100		0.150 - 0.075	25
50.00	100		< 0.075	43
37.50	100	Effective Size		0,065
28.00	88	Uniformity Coefficient		171,7
20.00	76	Curvature Coefficient		0,0
14.00	66	Oversize Index		0,0
5.000	47	Shrinkage Product		41,0
2.000	44	Grading Coefficient		20,7
0.425	41	Grading Modulus		2,00
0.250	38	Atterberg Limits	Liquid Limit	21
0.150	30		Plasticity Index	2.0
0.075	19		Linear Shrinkage	1.0
0.060	5,6		PI < 0.075	
0.050	5,0	Unified Soil Classification		GC
0.020	3,3	US Highway Classification		A-1-b(0)
0.005	2,3			
0.002	1,0			

D10= 0,065 D30= 0,153 D60= 11,158



Deviation from Test Method :
Remarks and Notes : Chemistry: pH = 7.80 [SANS 5854] & Conductivity = 0.09 S/m [SANS 6240]

Opinions and interpretations are not included in our scope of works. (T0296)
The samples were subjected to analysis according to (SANS)(TMH5)(DOT)(ASTM).
The test results reported relate to the samples tested.
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Report compiled by : Juraine Okkies

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Job Request No.: RU3525
Ceder Land Geotechnical Consult (Pty) Ltd
PO Box 607
Ceres
6835
Attention : Frans Breylenbach

Date Reported : 2020-07-17

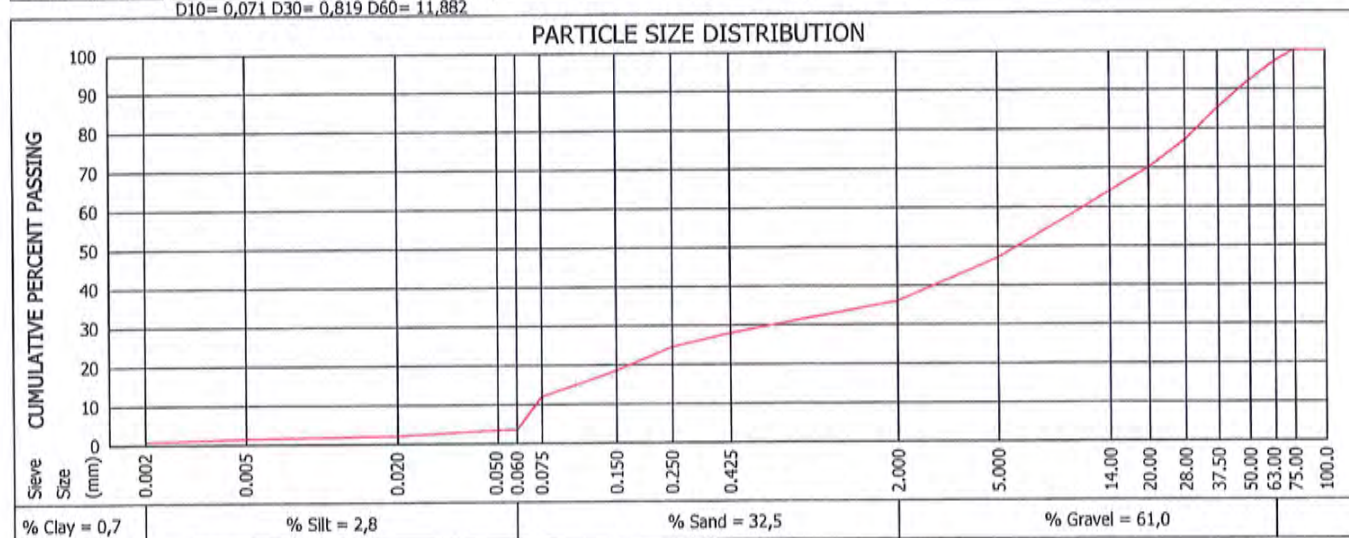
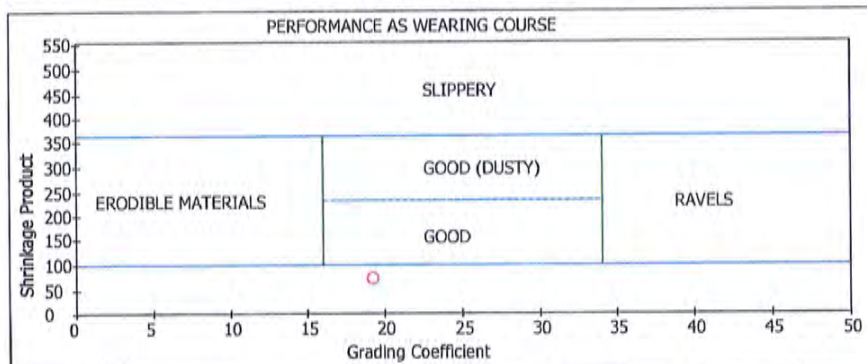
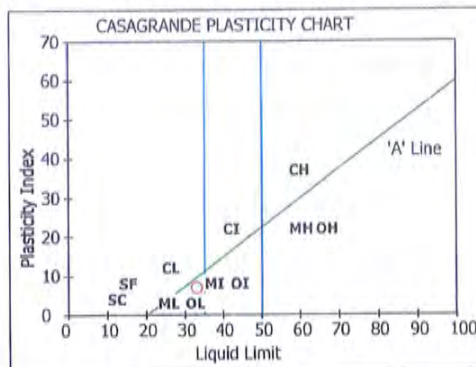
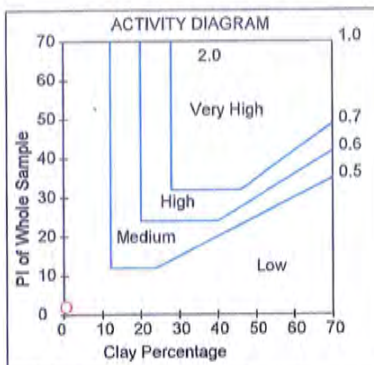
Project : Wegdraai Infrastructure Upgrade

Foundation Indicator Test Report SANS 3001 - GR1 / GR3 / GR10

Sample No. : U9271
Position : TP 17
Layer Type : 500-900mm
Sample Colour : Light Brown
Sample Type : Mix Weathered Quartz

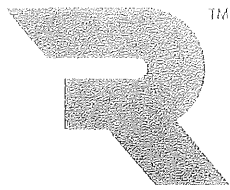
Sieve Size(mm)	% Passing	Soil Mortar	2.000 - 0.425	22
100.0	100		0.425 - 0.250	11
75.00	100		0.250 - 0.150	16
63.00	97		0.150 - 0.075	18
50.00	92		< 0.075	33
37.50	85	Effective Size		0,071
28.00	77	Uniformity Coefficient		167,4
20.00	70	Curvature Coefficient		0,8
14.00	64	Oversize Index		7,0
5.000	47	Shrinkage Product		70,0
2.000	36	Grading Coefficient		19,3
0.425	28	Grading Modulus		2,20
0.250	25	Atterberg Limits	Liquid Limit	33
0.150	19		Plasticity Index	7
0.075	12		Linear Shrinkage	2.5
0.060	3,5		PI < 0.075	
0.050	3,4	Unified Soil Classification		GW-GM
0.020	2,0	US Highway Classification		A-2-4(0)
0.005	1,4			
0.002	0,7			

D10= 0,071 D30= 0,819 D60= 11,882



Deviation from Test Method :
Remarks and Notes :

Opinions and interpretations are not included in our scope of works. (T0296)
The samples were subjected to analysis according to (SANS)(TMH5)(DOT)(ASTM).
The test results reported relate to the samples tested.
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Report compiled by : Juraine Okkies



ROADLAB

Job Request No.: RU3525

Ceder Land Geotechnical Consult (Pty) Ltd

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Attention : Frans Breytenbach

Project : Wegdraai Infrastructure Upgrade

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1401

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Web: www.roadlab.co.za

Date Reported : 2020-07-24

Determination of the California Bearing Ratio Test Report SANS 3001 - GR1 / GR2 / GR10 / GR20 / GR30 / GR40 / PR5

SAMPLE INFORMATION AND PROPERTIES

SAMPLE NO.	U9271		
HOLE NO./ Km / CHAINAGE	TP17		
ROAD NO./ NAME Line 1	S28° 50' 24,1"		
ROAD NO./ NAME Line 2	E21° 52' 02,5"		
LAYER TESTED/SAMPLED	500-900mm		
SAMPLE DEPTH	500-900mm		
DATE SAMPLED	2020-07-08		
COLOUR OF SAMPLE	Light Brown		
TYPE OF SAMPLE	Mix WQuartz+Calcrete		

SIEVE ANALYSIS - % PASSING SIEVES *(SANS 3001-GR1:2010, SANS 3001-GR2:2010)

SIEVE ANALYSIS (GR 1) % PASSING	100.0 mm		
	75.0 mm	100	
	63.0 mm	97	
	50.0 mm	92	
	37.5 mm	85	
	28.0 mm	77	
	20.0 mm	70	
	14.0 mm	64	
	5.0 mm	47	
	2.0 mm	36	
	0.425 mm	28	
	0.075 mm	12	
GM %		2.2	

SOIL MORTAR ANALYSIS (SANS 3001-PR5:2011)

COARSE SAND	2.000 - 0.425	22	
COARSE FINE SAND	0.425 - 0.250	11	
MEDIUM FINE SAND	0.250 - 0.150	16	
FINE FINE SAND	0.150 - 0.075	18	
SILT CLAY	0.075	33	

ATTERBERG LIMITS ANALYSIS - *(SANS 3001-GR10:2010)

ATTERBERG LIMITS (%) SANS GR10,GR11	LIQUID LIMIT	33	
	PLASTICITY INDEX	7	
	LINEAR SHRINKAGE	2.5	
CLASSIFICATION	H.R.B.	A-2-4(0)	
	COLTO	G7	
	TRH 14	G7	

CALIFORNIA BEARING RATIO - *(SANS 3001-GR30:2010, SANS 3001-GR40:2010)

SANS GR30	OMC %	9.2	
MAX. DRY DENSITY	MDD (kg/m³)	1932	
	COMP MC %	9.2	
SWELL % @	MOD NRB PRO	0.01 0.04 0.06	
	100 %	54	
C.B.R. SANS GR40	98 %	38	
	97 %	32	
	95 %	22	
	93 %	15	
	90 %	9	

STABILISER IN LAB	Not Applicable		
TEST TYPE	CBR		
SAMPLING METHOD	TMH 5		
WEATHER WHEN SAMPLED	Cold		

Deviation from Test Method :

Remarks and Notes :

Opinions and interpretations are not included in our schedule of accreditation. (T0296)
The samples were subjected to analysis according to (SANS)(TMH5)(DOT)(ASTM)
The test results reported relate to the samples tested.
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Report compiled by : Juralne Okkies

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D. Juckers
Technical Signatory

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Job Request No.: RU3525
Ceder Land Geotechnical Consult (Pty) Ltd
PO Box 607
Ceres
6835

Date Reported : 2020-07-23

Project : Wegdraai Infrastructure Upgrade

Attention : Frans Breytenbach

Determination Maximum Dry Density & Optimum Moisture Content Test Report

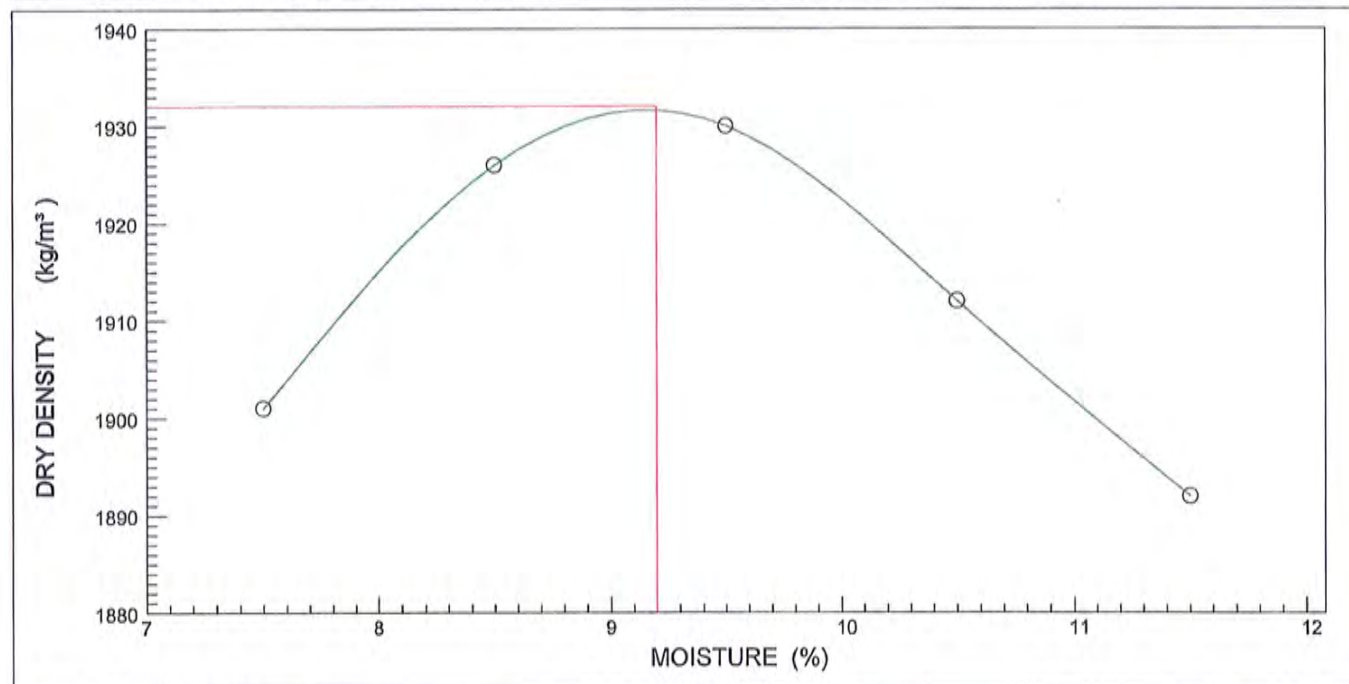
SANS 3001 - GR20/GR30

SAMPLE NO.	U9271
CONTAINER FOR SAMPLING	Black Bags
SIZE / APPROX. MASS OF SAMPLE	98kg
MOISTURE CONDITION OF SAMPLE	Moist
LAYER TESTED / SAMPLED FROM	500-900mm
MATERIAL DESCRIPTION	Mix Weathered Quartz + Calcrete
HOLE NO./ km / CHAINAGE	TP17
ROAD NO.	Not Specified
DATE RECEIVED	2020-07-09
DATE SAMPLED	2020-07-08
CLIENT MARKING	S28° 50' 24,1"; E21° 52' 02,5"
COLOUR AND TYPE	Light Brown Gravel

POINT NO.	1	2	3	4	5			
DRY DENSITY (kg/m³)	1901	1926	1930	1912	1892			
MOISTURE (%)	7,5	8,5	9,5	10,5	11,5			

MAXIMUM DRY DENSITY (kg/m³) : 1932

OPTIMUM MOISTURE CONTENT (%) : 9,2



Deviation from Test Method :
Remarks and Notes :

Opinions and interpretations are not included in our scope of works. (T0296)
The samples were subjected to analysis according to (SANS)(TMH5)(DOT)(ASTM).
The test results reported relate to the samples tested.
Further use of the above information is not the responsibility or liability of Roadlab.
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D Juckers

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7 ... of ...

Job Request No.: RU3525
Ceder Land Geotechnical Consult (Pty) Ltd
PO Box 607
Ceres
6835
Attention : Frans Breytenbach

Date Reported : 2020-08-06

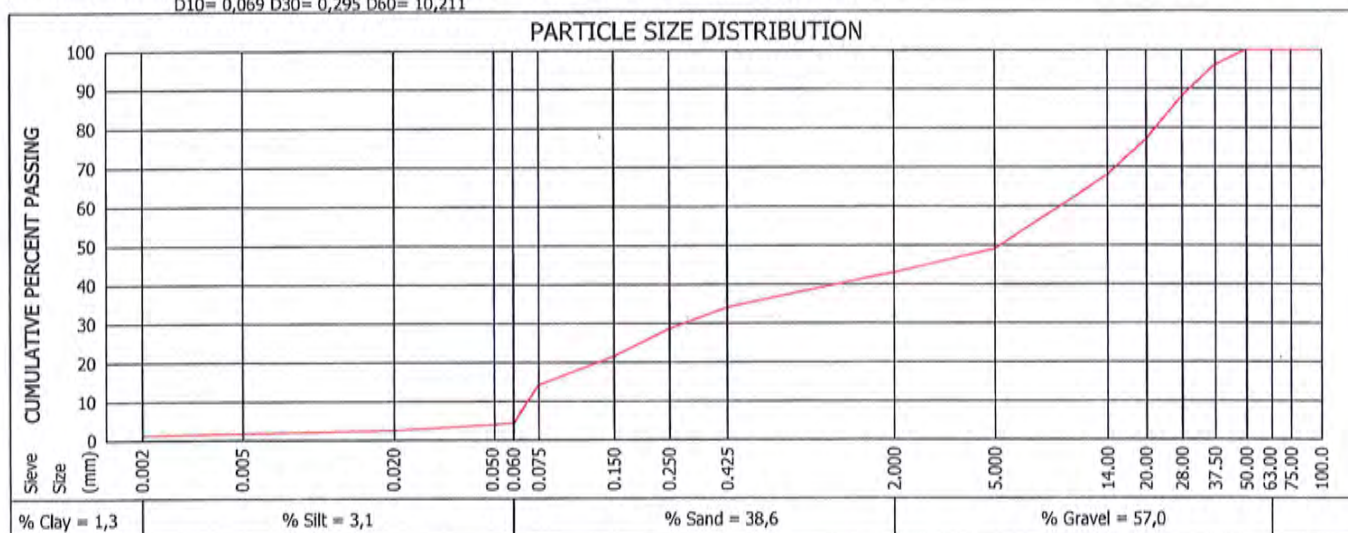
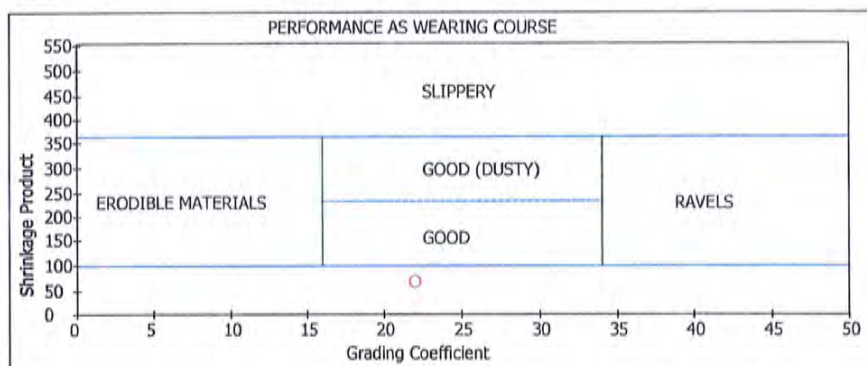
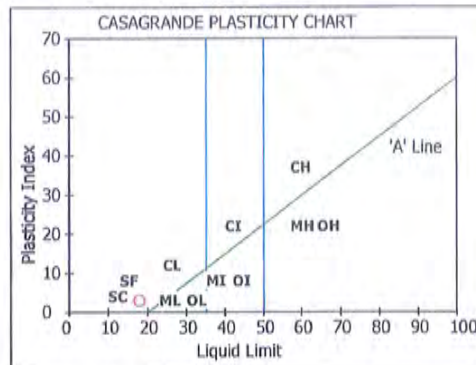
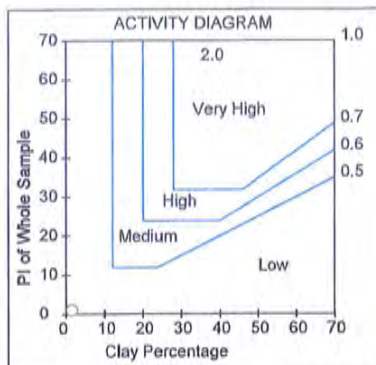
Project : Wegdraai Infrastructure Upgrade

Foundation Indicator Test Report SANS 3001 - GR1 / GR3 / GR10

Sample No. : U9272
Position : TP 21
Layer Type : 0-400mm
Sample Colour : Dark Brown Gravel
Sample Type : Mix Quartzstone

Sieve Size(mm)	% Passing	Soil Mortar		
100.0	100	2.000 - 0.425	21	
75.00	100	0.425 - 0.250	13	
63.00	100	0.250 - 0.150	17	
50.00	100	0.150 - 0.075	17	
37.50	96	< 0.075	33	
28.00	88	Effective Size	0,069	
20.00	77	Uniformity Coefficient	148,0	
14.00	68	Curvature Coefficient	0,1	
5.000	49	Oversize Index	4,0	
2.000	43	Shrinkage Product	68,0	
0.425	34	Grading Coefficient	22,1	
0.250	29	Grading Modulus	2,10	
0.150	22	Atterberg Limits		
0.075	14		Liquid Limit	18
0.060	4,4		Plasticity Index	3,0
0.050	3,9		Linear Shrinkage	2,0
0.020	2,5		PI < 0.075	
0.005	1,7	Unified Soil Classification	GC	
0.002	1,3	US Highway Classification	A-1-b(0)	

D10= 0,069 D30= 0,295 D60= 10,211




Deviation from Test Method :

Remarks and Notes : Chemistry: pH = 7.75 [SANS 5854] & Conductivity = 0.10 S/m [SANS 6240]

Opinions and interpretations are not included in our scope of works. (T0296)
The samples were subjected to analysis according to (SANS)(TMH5)(DOT)(ASTM).
The test results reported relate to the samples tested.
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Report compiled by : Jurnaine Okkies

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D Juckers
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9 of 15

Job Request No.: RU3525

Date Reported : 2020-08-12

Ceder Land Geotechnical Consult (Pty) Ltd

PO Box 607

Ceres

6835

Project : Wegdraai Infrastructure Upgrade

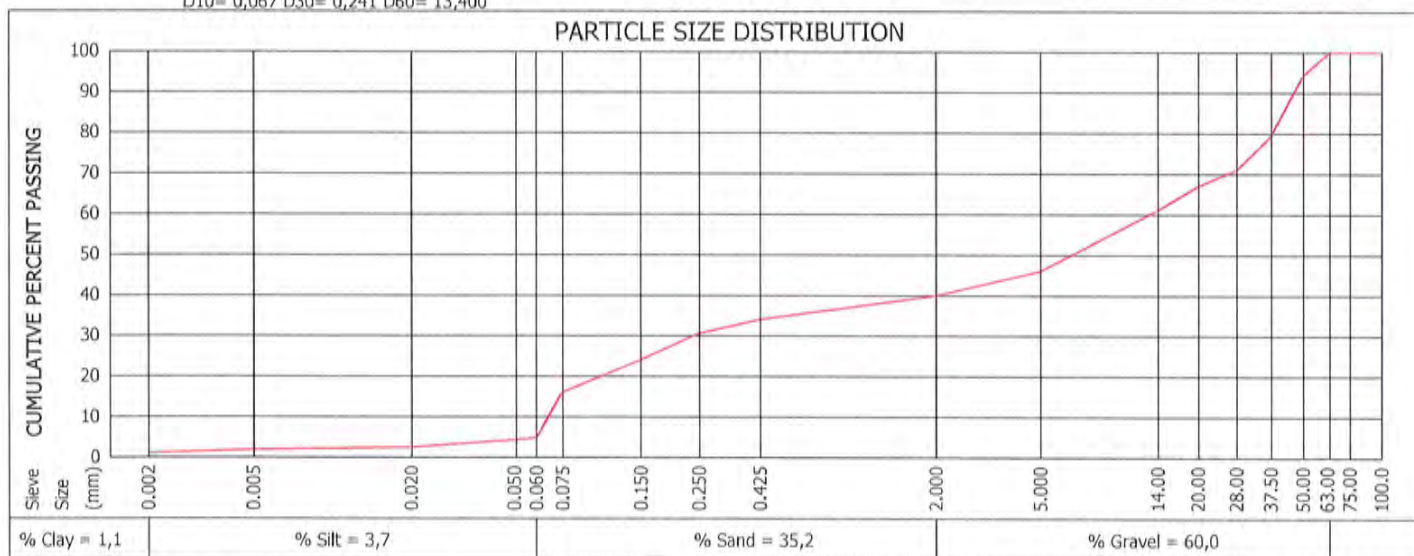
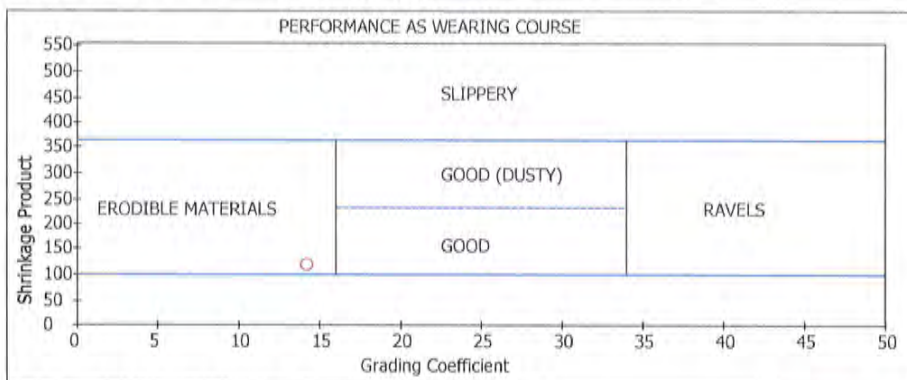
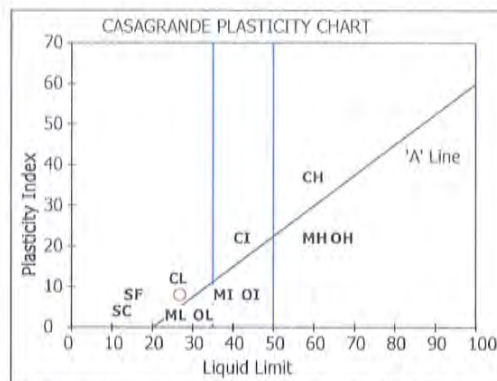
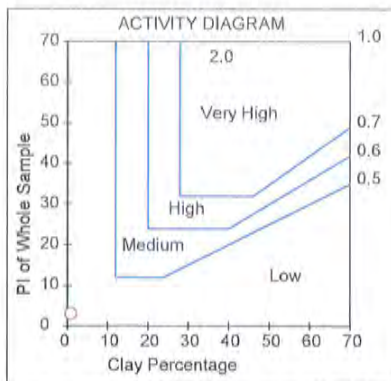
Attention : Frans Breytenbach

Foundation Indicator Test Report SANS 3001 - GR1 / GR3 / GR10

Sample No.	: U9273
Position	: TP 23
Layer Type	: 100-400mm
Sample Colour	: Brown Gravel
Sample Type	: Mix Calcrete+Quartz

Sieve Size(mm)	% Passing	Soil Mortar	2.000 - 0.425	15
100.0	100		0.425 - 0.250	10
75.00	100		0.250 - 0.150	16
63.00	100		0.150 - 0.075	20
50.00	94		< 0.075	40
37.50	79	Effective Size		0,067
28.00	71	Uniformity Coefficient		200,0
20.00	67	Curvature Coefficient		0,1
14.00	61	Oversize Index		15,0
5.000	46	Shrinkage Product		119,0
2.000	40	Grading Coefficient		14,3
0.425	34	Grading Modulus		2,10
0.250	31	Atterberg Limits	Liquid Limit	27
0.150	24		Plasticity Index	8
0.075	16		Linear Shrinkage	3.5
0.060	4,8		PI < 0.075	
0.050	4,3	Unified Soil Classification		GC
0.020	2,5	US Highway Classification		A-2-4(0)
0.005	1,9			
0.002	1,1			

D10= 0,067 D30= 0,241 D60= 13,400



Deviation from Test Method :

Remarks and Notes : Chemistry: pH = 7.87 [SANS 5854] & Conductivity = 0.09 S/m [SANS 6240]

Opinions and interpretations are not included in our scope of works. (T0296)
The samples were subjected to analysis according to (SANS)(TMH5)(DOT)(ASTM).
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Attention : Frans Breytenbach

Date Reported : 2020-08-05

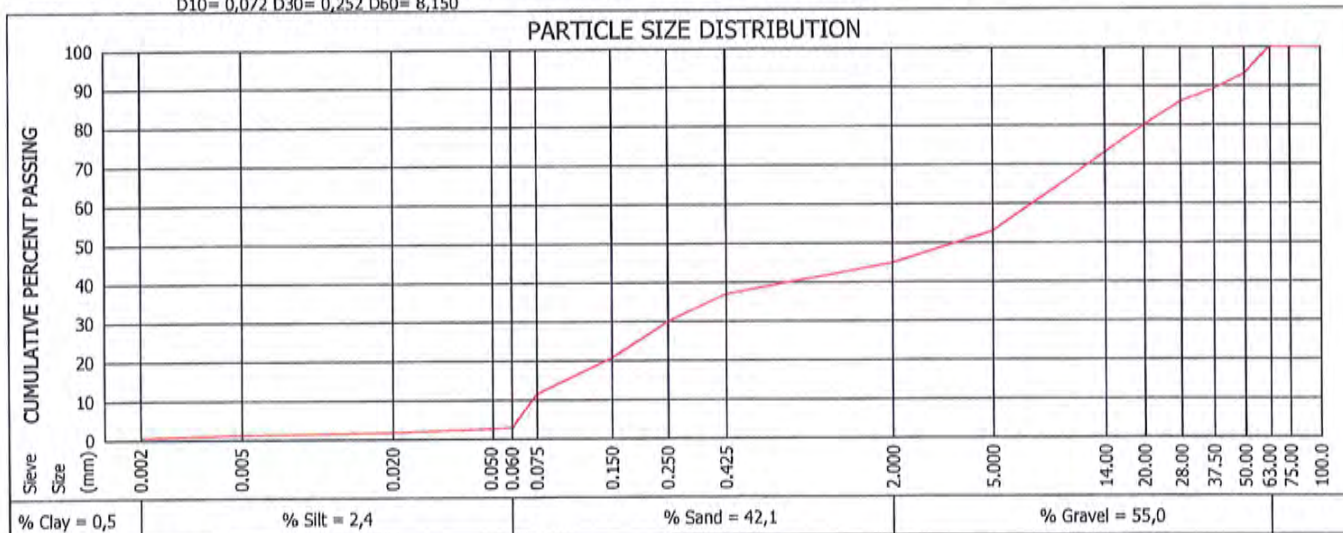
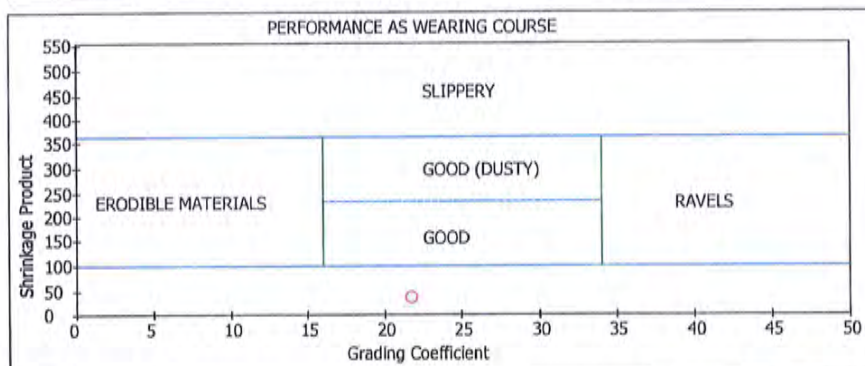
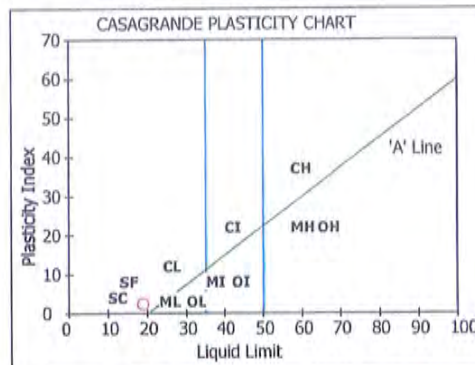
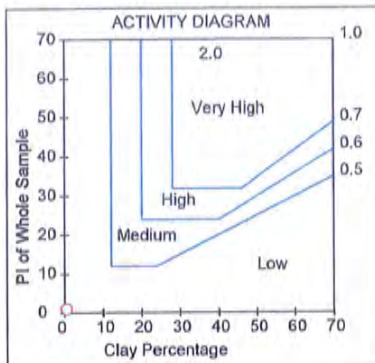
Project : Wegdraai

Foundation Indicator Test Report SANS 3001 - GR1 / GR3 / GR10

Sample No. : U9274
Position : TP 26
Layer Type : 200-600mm
Sample Colour : Brown Gravel
Sample Type : Mix Calcrete+Quartz

Sieve Size(mm)	% Passing	Soil Mortar	2.000 - 0.425	19
100.0	100		0.425 - 0.250	15
75.00	100		0.250 - 0.150	20
63.00	100		0.150 - 0.075	19
50.00	93		< 0.075	27
37.50	89	Effective Size		0,072
28.00	86	Uniformity Coefficient		113,2
20.00	80	Curvature Coefficient		0,1
14.00	73	Oversize Index		4,0
5.000	53	Shrinkage Product		37,0
2.000	45	Grading Coefficient		21,7
0.425	37	Grading Modulus		2,10
0.250	30	Atterberg Limits	Liquid Limit	19
0.150	21		Plasticity Index	2,0
0.075	12		Linear Shrinkage	1,0
0.060	2,9		PI < 0.075	
0.050	2,6	Unified Soil Classification		SW-SC
0.020	1,7	US Highway Classification		A-1-b(0)
0.005	1,2			
0.002	0,5			


D10 = 0,072 D30 = 0,252 D60 = 8,150



Deviation from Test Method :
Remarks and Notes :

Opinions and interpretations are not included in our scope of works. (T0296)
The samples were subjected to analysis according to (SANS)(TMH5)(DOT)(ASTM).
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D. Juckers
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Attention : Frans Breytenbach

Date Reported : 2020-07-17

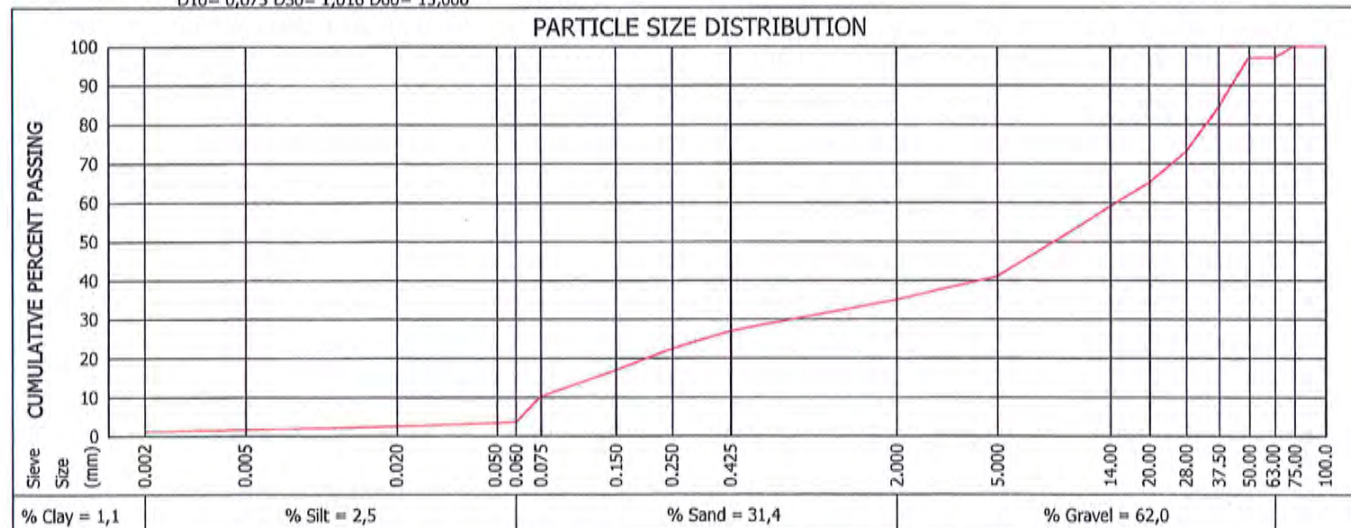
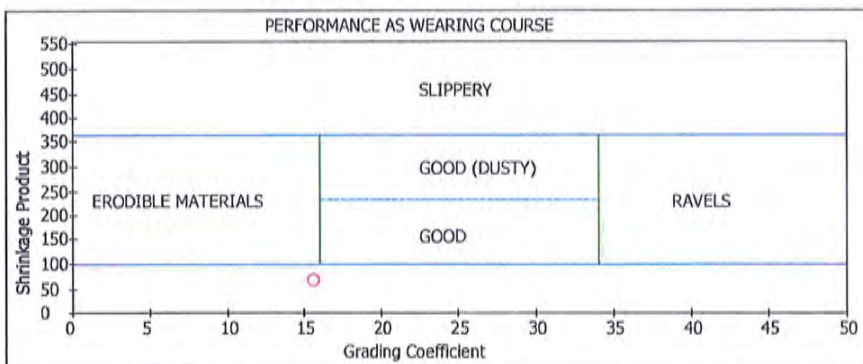
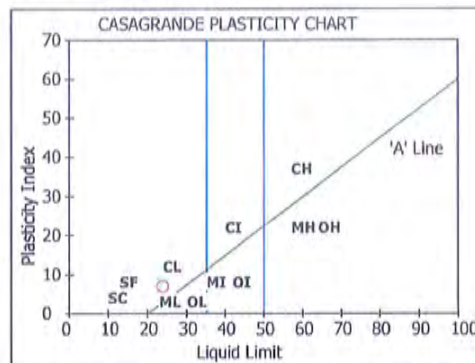
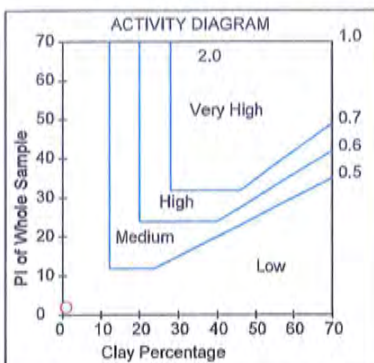
Project : Wegdraai Infrastructure Upgrade

Foundation Indicator Test Report SANS 3001 - GR1 / GR3 / GR10

Sample No.	: U9275
Position	: TP 30
Layer Type	: 200-1000mm
Sample Colour	: Brown Gravel
Sample Type	: Mix Calcrete+Quartz

Sieve Size(mm)	% Passing	Soil Mortar	2.000 - 0.425	22
100.0	100		0.425 - 0.250	14
75.00	100		0.250 - 0.150	16
63.00	97		0.150 - 0.075	20
50.00	97		< 0.075	29
37.50	84	Effective Size		0,075
28.00	73	Uniformity Coefficient		200,0
20.00	65	Curvature Coefficient		0,9
14.00	59	Oversize Index		13,0
5.000	41	Shrinkage Product		67,5
2.000	35	Grading Coefficient		15,6
0.425	27	Grading Modulus		2,30
0.250	22	Atterberg Limits	Liquid Limit	24
0.150	17		Plasticity Index	7
0.075	10		Linear Shrinkage	2.5
0.060	3,6		PI < 0.075	
0.050	3,3	Unified Soil Classification		GW-GM-GC
0.020	2,4	US Highway Classification		A-2-4(0)
0.005	1,6			
0.002	1,1			


D10= 0,075 D30= 1,016 D60= 15,000



Deviation from Test Method :
Remarks and Notes :

Opinions and interpretations are not included in our scope of works. (T0296)
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Job Request No.: RU3525
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PO Box 607
Ceres
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Project : Wegdraai Infrastructure Upgrade

Attention : Frans Breytenbach

Roadlab Germiston
207 Rietfontein Road Germiston
1401
Tel: 011 828 0279 Fax: 011 828 0279
Email: info@roadlab.co.za
Web: www.roadlab.co.za

Date Reported : 2020-08-04

Determination of the California Bearing Ratio Test Report SANS 3001 - GR1 / GR2 / GR10 / GR20 / GR30 / GR40 / PR5

SAMPLE INFORMATION AND PROPERTIES

SAMPLE NO.	U9275		
HOLE NO./ Km / CHAINAGE	TP30		
ROAD NO./ NAME Line 1	S26° 50' 18,5"		
ROAD NO./ NAME Line 2	E21° 51' 46,1"		
LAYER TESTED/SAMPLED	200-1000mm		
SAMPLE DEPTH	200-1000mm		
DATE SAMPLED	2020-07-09		
COLOUR OF SAMPLE	Brown		
TYPE OF SAMPLE	Mix Calcrete+Quartz		

SIEVE ANALYSIS - % PASSING SIEVES *(SANS 3001-GR1:2010, SANS 3001-GR2:2010)

SIEVE ANALYSIS - % PASSING SIEVES (SAND 60/75, GRAVEL 75/150, CRUSHED STONE 150/300)					
SIEVE ANALYSIS (GR 1) % PASSING	100.0 mm				
	75.0 mm	100			
	63.0 mm	97			
	50.0 mm	97			
	37.5 mm	84			
	28.0 mm	73			
	20.0 mm	65			
	14.0 mm	59			
	5.0 mm	41			
	2.0 mm	35			
	0.425 mm	27			
	0.075 mm	10			
GM %		2,3			

SOIL MORTAR ANALYSIS (SANS 3001-PR5:2011)

COARSE SAND	2.000 - 0.425	22	
COARSE FINE SAND	0.425 - 0.250	14	
MEDIUM FINE SAND	0.250 - 0.150	16	
FINE FINE SAND	0.150 - 0.075	20	
SILT CLAY	0.075	29	

ATTERBERG LIMITS ANALYSIS - *(SANS 3001-GR10:2010)

ATTERBERG LIMITS (%) SANS GR10,GR11	LIQUID LIMIT	24	
	PLASTICITY INDEX	7	
	LINEAR SHRINKAGE	2,5	
CLASSIFICATION	H.R.B.	A-2-4(0)	
	COLTO	G6	
	TRH 14	G7	

CALIFORNIA BEARING RATIO - *(SANS 3001-GR30:2010, SANS 3001-GR40:2010)

SANS GR30 MAX. DRY DENSITY	OMC %	7,5	
	MDD (kg/m³)	2153	
	COMP MC %	7,7	
SWELL % @	MOD NRB PRO	0,01 0,03 0,05	
	100 %	100	
	98 %	66	
C.B.R. SANS GR40	97 %	53	
	95 %	35	
	93 %	23	
	90 %	12	

STABILISER IN LAB	Not Applicable		
TEST TYPE	CBR		
SAMPLING METHOD	TMH 5		
WEATHER WHEN SAMPLED	Cold		

Deviation from Test Method :

Remarks and Notes :

Opinions and interpretations are not included in our scope of works. (T0296)
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Date Reported : 2020-08-04

Project : Wegdraai Infrastructure Upgrade

Attention : Frans Breytenbach

Determination Maximum Dry Density & Optimum Moisture Content Test Report

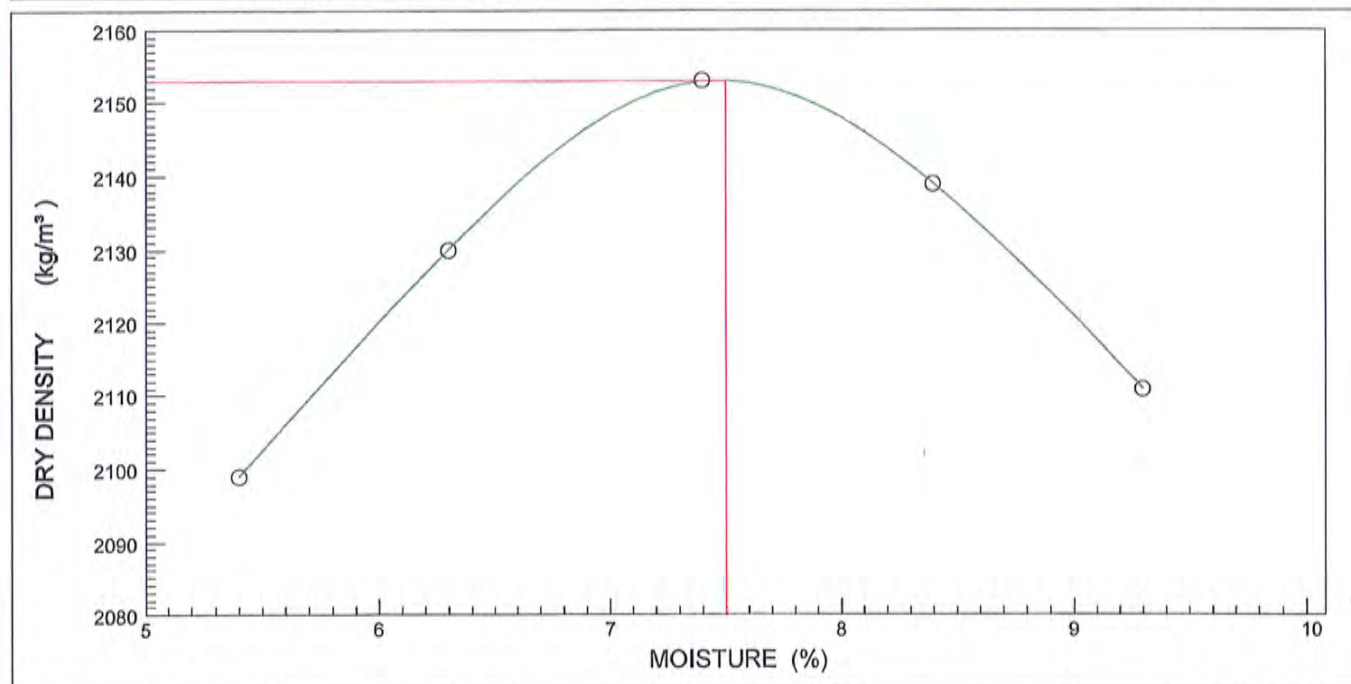
SANS 3001 - GR20/GR30

SAMPLE NO.	U9275
CONTAINER FOR SAMPLING	Black Bags
SIZE / APPROX. MASS OF SAMPLE	102kg
MOISTURE CONDITION OF SAMPLE	Moist
LAYER TESTED / SAMPLED FROM	200-1000mm
MATERIAL DESCRIPTION	Mix Calcrete + Quartzstone
HOLE NO./ km / CHAINAGE	TP30
ROAD NO.	Not Specified
DATE RECEIVED	2020-07-09
DATE SAMPLED	2020-07-13
CLIENT MARKING	S28° 50' 18,5"; E21° 51" 46,1
COLOUR AND TYPE	Brown Gravel

POINT NO.	1	2	3	4	5			
DRY DENSITY (kg/m ³)	2099	2130	2153	2139	2111			
MOISTURE (%)	5,4	6,3	7,4	8,4	9,3			

MAXIMUM DRY DENSITY (kg/m³) : 2153

OPTIMUM MOISTURE CONTENT (%) : 7,5



Deviation from Test Method :
Remarks and Notes :

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Date Reported : 2020-08-12

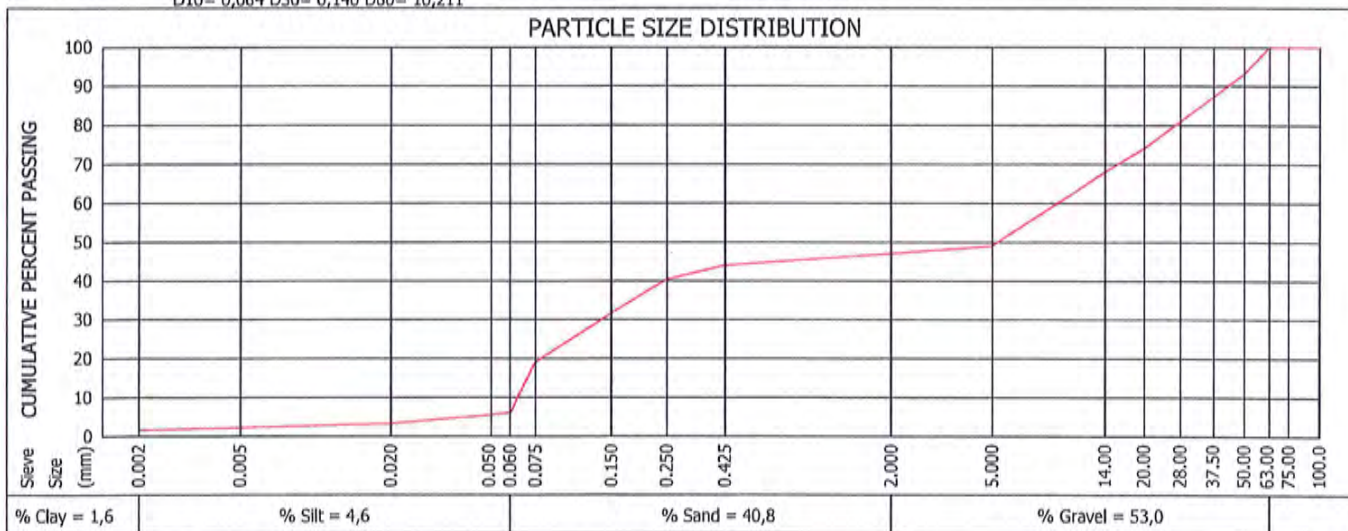
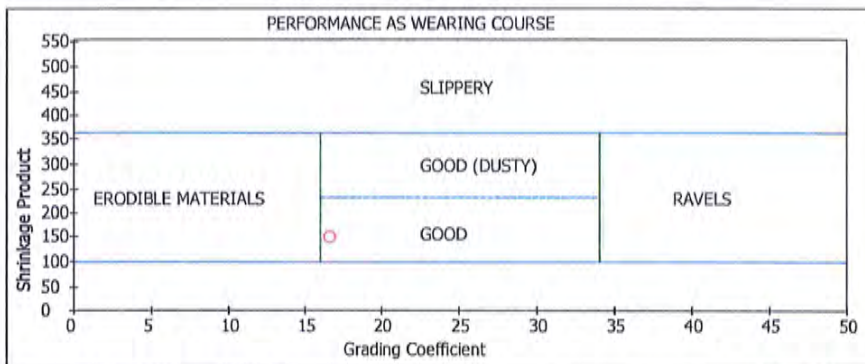
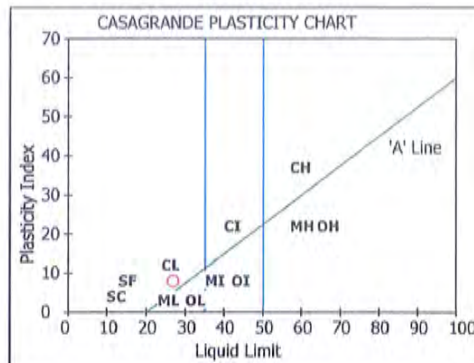
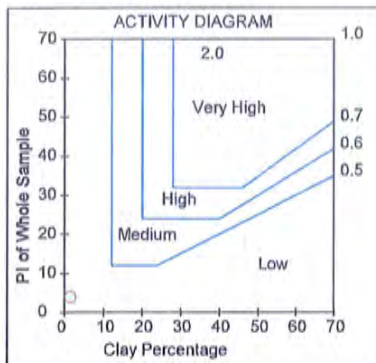
Project : Wegdraai Infrastructure Upgrade

Foundation Indicator Test Report SANS 3001 - GR1 / GR3 / GR10

Sample No. : U9276
Position : TP 31
Layer Type : 0-300mm
Sample Colour : Light Reddish Brown
Sample Type : Calcrete & Kalahari

Sieve Size(mm)	% Passing	Soil Mortar	2.000 - 0.425	6
100.0	100		0.425 - 0.250	9
75.0	100		0.250 - 0.150	19
63.0	100		0.150 - 0.075	27
50.0	93		< 0.075	40
37.5	87	Effective Size		0,064
28.0	81	Uniformity Coefficient		159,5
20.0	74	Curvature Coefficient		0,0
14.0	68	Oversize Index		6,0
5.000	49	Shrinkage Product		154,0
2.000	47	Grading Coefficient		16,7
0.425	44	Grading Modulus		1,90
0.250	40	Atterberg Limits	Liquid Limit	27
0.150	32		Plasticity Index	8
0.075	19		Linear Shrinkage	3.5
0.060	6,2		PI < 0.075	
0.050	5,5	Unified Soil Classification		GC
0.020	3,3	US Highway Classification		A-2-4(0)
0.005	2,2			
0.002	1,6			

D10= 0,064 D30= 0,140 D60= 10,211



Deviation from Test Method :
Remarks and Notes : Chemistry: pH = 7.81 [SANS 5854] & Conductivity = 0.07 S/m [SANS 6240]

Opinions and interpretations are not included in our scope of works. (T0296)
The samples were subjected to analysis according to (SANS)(TMH5)(DOT)(ASTM).
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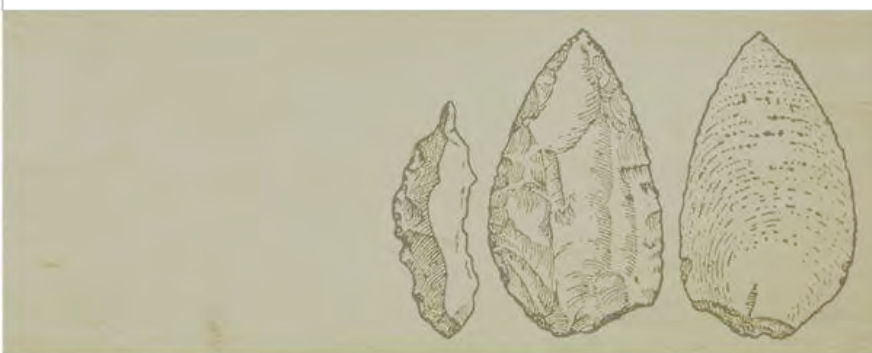
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ANNEXURE H: HERITAGE ASSESSMENT





PHASE 1 HIA REPORT !KHEIS TOWNSHIP EXPANSION WEGDRAAI NORTHERN CAPE

PROPOSED TOWNSHIP EXPANSION ON
ERVEN 1, 45 & 47 WEGDRAAI, BOEGOEBERG SETTLEMENT (KENHARDT),
FARM BOEGOEBERGNEDERSETTING RE/48,
!KHEIS LOCAL MUNICIPALITY, ZF MGCAWU DISTRICT MUNICIPALITY,
NORTHERN CAPE.

REFERENCE: NC/21/2018/PP (WEGDRAAI 360)/BH0070)

PREPARED FOR:
ENVIROAFRICA

PREPARED BY:
HEIDI FIVAZ & JAN ENGELBRECHT
UBIQUE HERITAGE CONSULTANTS

29 JUNE 2020

Client: EnviroAfrica CC.

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Fax: 086 512 0154 / Tel: 021 8511616 /
Email: admin@enviroafrica.co.za

Contact Person: Bernard de Witt
Email: bernard@enviroafrica.co.za

Heritage Consultant: UBIQUE Heritage Consultants

Contact Person: Jan Engelbrecht (archaeologist and lead CRM specialist)
Member of the Association of Southern African Professional
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Email: jan@ubiquecrm.com

Heidi Fivaz (archaeologist)
Member of the Association of Southern African Professional
Archaeologists: Member number: 433
Cell: (+27) 0721418860
Email: heidi@ubiquecrm.com

For this project, Mr Engelbrecht was responsible for the field survey of the development footprint, identification of heritage resources, and recommendations. Ms Fivaz was responsible for research and report compilation. The desktop study was conducted by Sky-Lee Fairhurst and the PIA was completed by Elize Butler.

Declaration of independence:

We, Jan Engelbrecht and Heidi Fivaz, partners of UBIQUE Heritage Consultants, hereby confirm our independence as heritage specialists and declare that:

- we are suitably qualified and accredited to act as independent specialists in this application;
- we do not have any vested interests (either business, financial, personal or other) in the proposed development project other than remuneration for the heritage assessment and heritage management services performed;
- the work was conducted in an objective and ethical manner, in accordance with a professional code of conduct and within the framework of South African heritage legislation.



Signed:

J.A.C. Engelbrecht & H. Fivaz
UBIQUE Heritage Consultants

Date: 2020-06-29

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JAN ENGELBRECHT

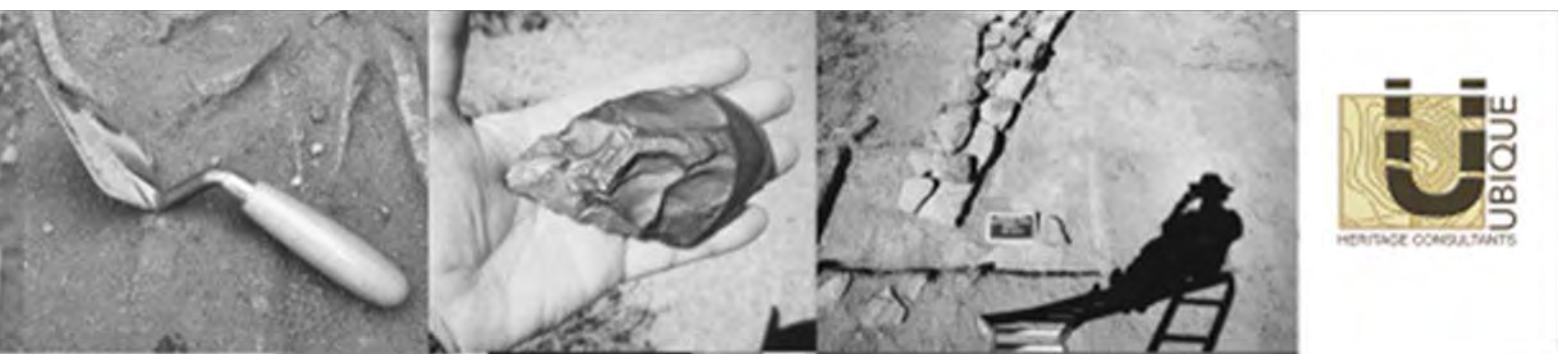
CRM ARCHAEOLOGIST

Jan Engelbrecht is accredited by the Cultural Resources Management section of the Association of Southern African Professional Archaeologists (ASAPA) to undertake Phase 1 AIAs and HIAs in South Africa. He is also a member of the Association for Professional Archaeologists (ASAPA). Mr Engelbrecht holds an honours degree in archaeology (specialising in the history of early farmers in southern Africa (Iron Age) and Colonial period) from the University of South Africa. He has 12 years' experience in heritage management. He has worked on projects as diverse as the Zulti South HIA project of Richards Bay Minerals, research on the David Bruce heritage site at Ubombo in Kwa-Zulu Natal, and various archaeological excavations and historical projects. He has worked with many rural communities to establish integrated heritage and land use plans and speaks Zulu fluently. Mr Engelbrecht established Ubique Heritage Consultants during 2012. The company moved from KZN to the Northern Cape and is currently based at Askham in the Northern Cape within the Dawid Kruiper Local Municipality in the Kgalagadi region. He had a significant military career as an officer, whereafter he qualified as an Animal Health Technician at Technikon RSA and UNISA. He is currently studying for his MA Degree in Archaeology.

HEIDI FIVAZ

ARCHAEOLOGIST & OBJECT CONSERVATOR

Heidi Fivaz has been a part of UBIQUE Heritage Consultants since 2016 and is responsible for research and report compilation. She holds a B.Tech. Fine Arts degree (2000) from Tshwane University of Technology, a BA Culture and Arts Historical Studies degree (2012) from UNISA and received her BA (Hons) Archaeology in 2015 (UNISA). She has received extensive training in object conservation from the South African Institute of Object Conservation and specialises in glass and ceramics conservation. She is also a skilled artefact and archaeological illustrator. Ms Fivaz is currently completing her MA Archaeology at the University of South Africa (UNISA), with a focus on historical and industrial archaeology. She is a professional member of the Association of South African Archaeologists and has worked on numerous archaeological excavation and surveying projects over the past ten years.



EXECUTIVE SUMMARY

Project description

UBIQUE Heritage Consultants were appointed by EnviroAfrica cc as independent heritage specialists in accordance with Section 38 of the NHRA and the National Environmental Management Act 107 of 1998 (NEMA), to conduct a cultural heritage assessment to determine the impact of the proposed township expansion on Erven 1, 45 and 47, Wegdraai, Boegoeberg Settlement (Kenhardt), on the Farm Boegoebergnedersetting RE/48, !Kheis Local Municipality, ZF Mgcawu District Municipality, Northern Cape, on any sites, features, or objects of cultural heritage significance.

Findings and Impact on Heritage Resources

Six incidences of ESA/MSA lithic material were recorded across the development footprint. These include a few formal tools like scrapers and a bladelet, but the lithic assemblage predominantly consists of informal tools and knapping debris. The lithics are all banded ironstone formation (BIF), an abundant raw material within the area. The material was documented as surface scatters, with no archaeological context. The resources will be affected negatively by the proposed development, but due to the low significance of the material, the impact is negligible. Unfenced cemeteries are located adjacent and within the development footprint. Construction activities may affect these sites negatively. Mitigation is recommended.

The proposed development is underlain by red-brown, wind-blown sand and dunes of the Kalahari Group (Gordonia Formation) as well as Tertiary sediments. Underlying these rocks are deposits of the Precambrian Transvaal Supergroup. According to the PalaeoMap of South African Heritage Resources Information System (SAHRIS), the Palaeontological Sensitivity of the Kalahari Group is moderate, while that of the Tertiary is low. Palaeontological Sensitivity of the Precambrian rocks of the Transvaal Supergroup is moderate. However, the cherts, dolomites and iron formations of the underlying Transvaal Supergroup are too deep to affect the proposed development (Butler 2020).

Recommendations

Based on the assessment of the potential impact of the development on the identified heritage, the following recommendations are made, taking into consideration any existing or potential sustainable social and economic benefits:

1. No significant heritage sites or features were identified within the surveyed sections of Wegdraai township, on Erven 1, 45, and 47, Boegoeberg Settlement, on the Farm Boegoebergnedersetting RE/48. The Early/Middle Stone Age cultural material identified is not conservation worthy. No further mitigation is recommended with regards to these resources. Therefore, from a heritage point of view, we recommend that the proposed development can continue.

2. The cemeteries WGD002 and WGD003 are situated close to the proposed development footprint Site IV. The sites are graded as IIIB and are of High Local Significance. It is recommended that the graves be fenced off with the inclusion of a 50 m buffer/safety zone. Constant monitoring of the graves along the dry riverine should be undertaken by the municipality, to ensure timely mitigation if human remains become exposed by erosion.

3. Due to the low palaeontological significance of the area, no further palaeontological heritage studies, ground-truthing and/or specialist mitigation are required. It is considered that the development of the proposed development is deemed appropriate and feasible and will not lead to detrimental impacts on the palaeontological resources of the area (Butler 2020). If fossil remains or trace fossils are discovered during any phase of construction, either on the surface or exposed by excavations the Chance Find Protocol (Appendix A/11) must be implemented by the Environmental Control Officer (ECO) in charge of these developments. These discoveries ought to be protected, 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 mitigation can be carried out by a palaeontologist (Butler 2020).

4. Although all possible care has been taken to identify 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 assessment. If during construction, any evidence of archaeological sites or remains (e.g. remnants of stone-made structures, indigenous ceramics, bones, stone artefacts, ostrich eggshell fragments, charcoal and ash concentrations), fossils or other categories of heritage resources are found during the proposed development, SAHRA APM Unit (Natasha Higgitt/Phillip Hine 021 462 5402) must be alerted as per section 35(3) of the NHRA. If unmarked human burials are uncovered, the SAHRA Burial Grounds and Graves (BGG) Unit (Thingahangwi Tshivhase/Mimi Seetelo 012 320 8490), must be alerted immediately as per section 36(6) of the NHRA. A professional archaeologist or palaeontologist, depending on the nature of the finds, must be contacted as soon as possible to inspect the findings. If the newly discovered heritage resources prove to be of archaeological or palaeontological significance, a Phase 2 rescue operation may be required subject to permits issued by SAHRA. UBIQUE Heritage Consultants and its personnel will not be held liable for such oversights or costs incurred as a result of such oversights.

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ABBREVIATIONS

AIA:	Archaeological Impact Assessment
ASAPA:	Association of South African Professional Archaeologists
BIA:	Basic Impact Assessment
CRM:	Cultural Resource Management
ECO:	Environmental Control Officer
EIA:	Environmental Impact Assessment*
EIA:	Early Iron Age*
EMP:	Environmental Management Plan
ESA:	Earlier Stone Age
GPS:	Global Positioning System
HIA:	Heritage Impact Assessment
LIA:	Late Iron Age
LSA:	Later Stone Age
MEC:	Member of the Executive Council
MIA:	Middle Iron Age
MPRDA:	Mineral and Petroleum Resources Development Act
MSA:	Middle Stone Age
NEMA:	National Environmental Management Act
NHRA:	National Heritage Resources Act
OWC:	Orange River Wine Cellars
PRHA:	Provincial Heritage Resource Agency
SADC:	Southern African Development Community
SAHRA:	South African Heritage Resources Agency
SAHRIS:	South African Heritage Resources Information System

**Although EIA refers to both Environmental Impact Assessment and the Early Iron Age both are internationally accepted abbreviations it must be read and interpreted in the context it is used.*

GLOSSARY

Archaeological:	<p>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;</p> <ul style="list-style-type: none"> – rock art, being any 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 (as defined and protected by the National Heritage Resources Act (NHRA) (Act No. 25 of 1999) including any area within 10 m of such representation; – wrecks, being any vessel or aircraft, or any part thereof, which were wrecked in South Africa, whether on land, in the internal waters, the territorial waters or in the culture zone of the Republic, as defined respectively in sections 3, 4 and 6 of the Maritime Zones Act, 1994 (Act No. 15 of 1994), and any cargo, debris or artefacts found or associated therewith, which is older than 60 years or which SAHRA considers to be worthy of conservation; – features, structures and artefacts associated with military history, which are older than 75 years and the sites on which they are found.
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Stone Age:	The first and longest part of human history is the Stone Age, which began with the appearance of early humans between 3-2 million years ago. Stone Age people were hunters, gatherers and scavengers who did not live in permanently settled communities. Their stone tools preserve well and are found in most places in South Africa and elsewhere.
Earlier Stone Age:	>2 000 000 - >200 000 years ago
Middle Stone Age:	<300 000 - >20 000 years ago
Later Stone Age:	<40 000 - until the historical period
Iron Age:	(Early Farming Communities). Period covering the last 1800 years, when immigrant African farmer groups brought a new way of life to southern Africa. They established settled villages, cultivated domestic crops such as sorghum, millet and beans, and herded cattle as well as sheep and goats. As they produced their own iron tools, archaeologists call this the Iron Age. Early Iron Age: AD 200 - AD 900 Middle Iron Age: AD 900 - AD 1300 Later Iron Age: AD 1300 - AD 1850
Historic:	Period of arrival of white settlers and colonial contact. AD 1500 to 1950
Historic building:	Structures 60 years and older.
Fossil:	Mineralised bones of animals, shellfish, plants and marine animals. A trace fossil is the track or footprint of a fossil animal that is preserved in stone or consolidated sediment.
Heritage:	That which is inherited and forms part of the National Estate (historic places, objects, fossils as defined by the National Heritage Resources Act 25 of 1999).
Heritage resources:	These mean any place or object of cultural significance, tangible or intangible.
Holocene:	The most recent geological period that commenced 10 000 years ago.
Palaeontology:	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 that contains such fossilised remains or traces
Cumulative impacts:	“Cumulative Impact”, in relation to an activity, means the past, current and reasonably foreseeable future impact of an activity, considered together with the impact of activities associated with that activity that may not be significant, but may become significant when added to existing and reasonably foreseeable impacts eventuating from similar or diverse activities.
Mitigation:	Anticipating and preventing negative impacts and risks, then to minimise them, rehabilitate or repair impacts to the extent feasible.
A ‘place’:	a site, area or region;

- a building or other structure which may include equipment, furniture, fittings and articles associated with or connected with such building or other structure;
- 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;
- 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.

‘Public monuments and memorials’: mean all monuments and memorials—

- erected on land belonging to any branch of central, provincial or local government, or on land belonging to any organisation funded by or established in terms of the legislation of such a branch of government; or
- which were paid for by public subscription, government funds, or a public-spirited or military organisation, and are on land belonging to any private individual;

‘Structures’: any building, works, device or other facility made by people and which are fixed to land, and include any fixtures, fittings and equipment associated therewith.

1. INTRODUCTION

1.1 Scope of study

The project involves the expansion of the Wegdraai township on Erven 1, 45 and 47, Boegoeberg Settlement, on the Farm Boegoebergnedersetting RE/48 in the !Kheis Local Municipality, ZF Mgcawu District Municipality, Northern Cape. UBIQUE Heritage Consultants were appointed by EnviroAfrica cc as independent heritage specialists in accordance with the National Environmental Management Act 107 of 1998 (NEMA), and in compliance with Section 38 of the National Heritage Resources Act 25 of 1999 (NHRA), to conduct a cultural heritage assessment (AIA/HIA) of the development area.

The assessment aims to identify and report any heritage resources that may fall within the development footprint; to determine the impact of the proposed development on any sites, features, or objects of cultural heritage significance; to assess the significance of any identified resources; and to assist the developer in managing the documented heritage resources in an accountable manner, within the framework provided by the National Heritage Resources Act (Act 25 of 1999) (NHRA).

South Africa's heritage resources are both rich and widely diverse, encompassing sites from all periods of human history. Resources may be tangible, such as buildings and archaeological artefacts, or intangible, such as landscapes and living heritage. Their significance is based upon their aesthetic, architectural, historical, scientific, social, spiritual, linguistic, economic or technological values; their representation of a time or group; their rarity; and their sphere of influence.

The integrity and significance of heritage resources can be jeopardised by natural (e.g. erosion) and human (e.g. development) activities. In the case of human activities, a range of legislation exists to ensure the timeous and accurate identification and effective management of heritage resources for present and future generations.

The result of this investigation is presented within this heritage impact assessment report. It comprises the recording of heritage resources present/ absent and offers recommendations for the management of these resources within the context of the proposed development.

Depending on SAHRA's acceptance of this report, the developer will receive permission to proceed with the proposed development, taking into account any proposed mitigation measures.

1.2 Assumptions and limitations

It is assumed that the description of the proposed project, as provided by the client, is accurate. Furthermore, it is assumed that the public consultation process undertaken as part of the Environmental Impact Assessment (EIA) is comprehensive and does not have to be repeated as part of the heritage impact assessment.

The significance of the sites, structures and artefacts is determined by means of their historical, social, aesthetic, technological and scientific value in relation to their uniqueness, condition of preservation and research potential. The various aspects are not mutually exclusive, and the evaluation of any site is done with reference to any number of these aspects. Cultural significance is site-specific and relates to the content and context of the site.

All possible care has been taken during the comprehensive field survey and intensive desktop study to identify sites of cultural importance within the development areas. However, it is essential to note that some heritage sites may have been missed due to their subterranean nature, or due to dense vegetation cover. No subsurface investigation (i.e. excavations or sampling) were undertaken since a permit from SAHRA is required for such activities. Therefore, should any heritage features and/or objects such as architectural features, stone tool scatters, artefacts, human remains, or fossils be uncovered or observed during construction, operations must be stopped, and a qualified archaeologist contacted for an assessment of the find. Observed or located heritage features and/or objects may not be disturbed or removed in any way until such time that the heritage specialist has been able to assess the significance of the site (or material) in question.

2. TERMS OF REFERENCE

An HIA/ AIA must address the following key aspects:

- the identification and mapping of all heritage resources in the area affected;
- an assessment of the significance of such resources in terms of heritage assessment criteria set out in regulations;
- an assessment of the impact of the development on heritage resources;
- 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;
- if heritage resources will be adversely affected by the proposed development, the consideration of alternatives; and
- plans for mitigation of any adverse effects during and after completion of the proposed development.

In addition, the HIA/AIA should comply with the requirements of NEMA, including providing the assumptions and limitations associated with the study; the details, qualifications and expertise of the person who prepared the report; and a statement of competency.

2.1. Statutory Requirements

2.1.1 General

The Constitution of the Republic of South Africa Act 108 of 1996 is the source of all legislation. Within the Constitution the Bill of Rights is fundamental, with the principle that the environment should be protected for present and future generations by preventing pollution, promoting conservation and practising ecologically sustainable development. With regard to spatial planning and related legislation at national and provincial levels the following legislation may be relevant:

- Physical Planning Act 125 of 1991
- Municipal Structures Act 117 of 1998
- Municipal Systems Act 32 of 2000
- Development Facilitation Act 67 of 1995 (DFA)

The identification, evaluation and management of heritage resources in South Africa are required and governed by the following legislation:

- National Environmental Management Act 107 of 1998 (NEMA)
- KwaZulu-Natal Heritage Act 4 of 2008 (KZNHA)
- National Heritage Resources Act 25 of 1999 (NHRA)
- Minerals and Petroleum Resources Development Act 28 of 2002 (MPRDA)

2.1.2 National Heritage Resources Act 25 of 1999

The NHRA established the South African Heritage Resources Agency (SAHRA) together with its Council to fulfil the following functions:

- coordinate and promote the management of heritage resources at national level;

- set norms and maintain essential national standards for the management of heritage resources in the Republic and to protect heritage resources of national significance;
- control the export of nationally significant heritage objects and the import into the Republic of cultural property illegally exported from foreign countries;
- enable the provinces to establish heritage authorities which must adopt powers to protect and manage certain categories of heritage resources; and
- provide for the protection and management of conservation-worthy places and areas by local authorities.

2.1.3 Heritage Impact Assessments/Archaeological Impact Assessments

Section 38(1) of the NHRA of 1999 requires **the responsible heritage resources authority to notify the person who intends to undertake a development that fulfils the following criteria to submit an impact assessment report if there is reason to believe that heritage resources will be affected by such event:**

- the construction of a road, wall, power line, pipeline, canal or other similar form of linear development or barrier exceeding 300m in length;
- the construction of a bridge or similar structure exceeding 50m in length;
- any development or other activity that will change the character of a site—
 - exceeding 5000m² 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 rezoning of a site exceeding 10 000m² in extent; or
- any other category of development provided for in regulations by SAHRA or a provincial heritage resources authority.

2.1.4 Definitions of heritage resources

The NHRA defines a heritage resource as any place or object of cultural significance, i.e. of aesthetic, architectural, historical, scientific, social, spiritual, linguistic or technological value or significance. These include, but are not limited to, the following wide range of places and objects:

- living heritage as defined in the National Heritage Council Act No 11 of 1999 (cultural tradition; oral history; performance; ritual; popular memory; skills and techniques; indigenous knowledge systems; and the holistic approach to nature, society and social relationships);
- Ecofacts (non-artefactual organic or environmental remains that may reveal aspects of past human activity; definition used in KwaZulu-Natal Heritage Act 2008);
- places, buildings, structures and equipment;
- places to which oral traditions are attached or which are associated with living heritage;
- historical settlements and townscapes;
- landscapes and natural features;
- geological sites of scientific or cultural importance;

- archaeological and palaeontological sites;
- graves and burial grounds;
- public monuments and memorials;
- sites of significance relating to the history of slavery in South Africa;
- movable objects, but excluding any object made by a living person; and
- battlefields.

Furthermore, a place or object is to be considered part of the national estate if it has cultural significance or other special value because of—

- its importance in the community, or pattern of South Africa's history;
- its possession of uncommon, rare or endangered aspects of South Africa's natural or cultural heritage;
- its potential to yield information that will contribute to an understanding of South Africa's natural or cultural heritage;
- its importance in demonstrating the principal characteristics of a particular class of South Africa's natural or cultural places or objects;
- its importance in exhibiting particular aesthetic characteristics valued by a community or cultural group;
- its importance in demonstrating a high degree of creative or technical achievement at a particular period;
- its strong or special association with a particular community or cultural group for social, cultural or spiritual reasons; and
- its strong or special association with the life or work of a person, group or organisation of importance in the history of South Africa.

2.1.5 Management of Graves and Burial Grounds

- **Graves younger than 60 years** are protected in terms of Section 2(1) of the Removal of Graves and Dead Bodies Ordinance 7 of 1925 as well as the Human Tissues Act 65 of 1983.
- **Graves older than 60 years, situated outside a formal cemetery administered by a local Authority** are protected in terms of Section 36 of the NHRA as well as the Human Tissues Act of 1983. Accordingly, such graves are the jurisdiction of SAHRA. The procedure for Consultation Regarding Burial Grounds and Graves (Section 36(5) of NHRA) is applicable to graves older than 60 years that are situated outside a formal cemetery administered by a local authority. Graves in the category located inside a formal cemetery administered by a local authority will also require the same authorisation as set out for graves younger than 60 years over and above SAHRA authorisation.

The **protocol for the management of graves older than 60 years situated outside a formal cemetery administered by a local authority** is detailed in Section 36 of the NHRA:

- (3) (a) No person may, without a permit issued by SAHRA or a provincial heritage resources authority—

(a) destroy, damage, alter, exhume or remove from its original position or otherwise disturb the grave of a victim of conflict, or any burial ground or part thereof which contains such graves;

(b) destroy, damage, alter, exhume, remove from its original position or otherwise disturb any grave or burial ground older than 60 years which is situated outside a formal cemetery administered by a local authority; or

(c) bring onto or use at a burial ground or grave referred to in paragraph (a) or (b) any excavation equipment, or any equipment which assists in the detection or recovery of metals.

(4) SAHRA or a provincial heritage resources authority may not issue a permit for the destruction or damage of any burial ground or grave referred to in subsection (3)(a) unless it is satisfied that the applicant has made satisfactory arrangements for the exhumation and re-interment of the contents of such graves, at the cost of the applicant and in accordance with any regulations made by the responsible heritage resources authority.

(5) SAHRA or a provincial heritage resources authority may not issue a permit for any activity under subsection (3)(b) unless it is satisfied that the applicant has, in accordance with regulations made by the responsible heritage resources authority—

(a) made a concerted effort to contact and consult communities and individuals who by tradition have an interest in such grave or burial ground; and

(b) reached agreements with such communities and individuals regarding the future of such grave or burial ground.

(6) Subject to the provision of any other law, any person who in the course of development or any other activity discovers the location of a grave, the existence of which was previously unknown, must immediately cease such activity and report the discovery to the responsible heritage resources authority which must, in cooperation with the South African Police Service and in accordance with regulations of the responsible heritage resources authority—

(a) carry out an investigation for the purpose of obtaining information on whether or not such grave is protected in terms of this Act or is of significance to any community; and

(b) if such grave is protected or is of significance, assist any person who or community which is a direct descendant to make arrangements for the exhumation and re-interment of the contents of such grave or, in the absence of such person or community, make any such arrangements as it deems fit.

3. STUDY APPROACH AND METHODOLOGY

3.1 Desktop study

The first step in the methodology was to conduct a desktop study of the heritage background of the area and the site of the proposed development. This entailed the scoping and scanning of historical texts/records as well as previous heritage studies and research around the study area.

By incorporating data from previous CRM reports done in the area and an archival search, the study area is contextualised. The objective of this is to extract data and information on the area in question, looking at archaeological sites, historical sites and graves in the area.

No archaeological site data was available for the project area. A concise account of the archaeology and history of the broader study area was compiled (sources listed in the bibliography).

3.1.1 Literature review

A survey of the literature was undertaken to obtain background information regarding the area. Through researching the SAHRA APM Report Mapping Project records and the SAHRIS online database (<http://www.sahra.org.za/sahris>), it was determined that several other archaeological or historical studies had been performed within the broader vicinity of the study area. Sources consulted in this regard are indicated in the bibliography.

3.2 Field study

Phase 1 (AIA/HIA) requires the completion of a field study to establish and ensure the following:

3.2.1 Systematic survey

A systematic survey of the proposed project area to locate, identify, record, photograph and describe sites of archaeological, historical or cultural interest, was completed.

UBIQUE Heritage Consultants inspected the proposed development and surrounding areas on 21 May 2020 and completed a controlled-exclusive, pre-planned, pedestrian survey. We conducted an inspection of the surface of the ground, wherever the surface was visible. This was done with no substantial attempt to clear brush, sand, deadfall, leaves or other material that may cover the surface and with no effort to look beneath the surface beyond the inspection of rodent burrows, cut banks and other exposures fortuitously observed.

The survey was tracked with a handheld Garmin global positioning unit (Garmin eTrex 10).

3.2.2 Recording significant areas

GPS points of identified significant areas were recorded with a handheld Garmin global positioning unit (Garmin eTrex 10). Photographs were taken with a Canon IXUS 185 20-megapixel camera. Detailed field notes were taken to describe observations. The layout of the area and plotted GPS points, tracks and coordinates, were transferred to Google Earth and QGIS and maps were created.

3.2.3 Determining significance

Levels of significance of the various types of heritage resources observed and recorded in the project area will be determined to the following criteria:

Cultural significance:

- Low A cultural object being found out of context, not being part of a site or without any related feature/structure in its surroundings.
- Medium Any site, structure or feature being regarded less important due to several factors, such as date and frequency. Likewise, any important object found out of context.
- High Any site, structure or feature regarded as important because of its age or uniqueness. Graves are always categorised as of a high importance. Likewise, any important object found within a specific context.

Heritage significance:

- Grade I Heritage resources with exceptional qualities to the extent that they are of national significance
- Grade II Heritage resources with qualities giving it provincial or regional importance although it may form part of the national estate
- Grade III Other heritage resources of local importance and therefore worthy of Conservation

Field ratings:

- i. National Grade I significance should be managed as part of the national estate
- ii. Provincial Grade II significance should be managed as part of the provincial estate
- iii. Local Grade IIIA should be included in the heritage register and not be mitigated (high significance)
- iv. Local Grade IIIB should be included in the heritage register and may be mitigated (high/ medium significance)

- | | | |
|------|-----------------------------|---|
| v. | General protection A (IV A) | site should be mitigated before destruction (high/ medium significance) |
| vi. | General protection B (IV B) | site should be recorded before destruction (medium significance) |
| vii. | General protection C (IV C) | phase 1 is seen as sufficient recording and it may be demolished (low significance) |

Heritage value, statement of significance:

- a. its importance in the community, or pattern of South Africa's history;
- b. its possession of uncommon, rare or endangered aspects of South Africa's natural or cultural heritage;
- c. its potential to yield information that will contribute to an understanding of South Africa's natural or cultural heritage;
- d. its importance in demonstrating the principal characteristics of a particular class of south Africa's natural or cultural places or objects;
- e. its importance in exhibiting particular aesthetic characteristics valued by a community or cultural group;
- f. its importance in demonstrating a high degree of creative or technical achievement at a particular period;
- g. its strong or special association with a particular community or cultural group for social, cultural or spiritual reasons;
- h. its strong or special association with the life or work of a person, group or organisation of importance in the history of South Africa; and
- i. sites of significance relating to the history of slavery in South Africa.

3.2.4 Assessment of development impacts

A heritage resource impact may be defined broadly as the net change, either beneficial or adverse, between the integrity of a heritage site with and without the proposed development. Beneficial impacts occur wherever a proposed development actively protects, preserves or enhances a heritage resource, by minimising natural site erosion or facilitating non-destructive public use, for example. More commonly, development impacts are of an adverse nature and can include:

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

Beneficial and adverse impacts can be direct or indirect, as well as cumulative, as implied by the examples. Although indirect impacts may be more difficult to foresee, assess and quantify, they must form part of the assessment process. The following assessment criteria have been used to assess the impacts of the proposed development on possible identified heritage resources:

Criteria	Rating Scales	Notes
Nature	Positive	An evaluation of the type of effect the construction, operation and management of the proposed development would have on the heritage resource.
	Negative	
	Neutral	
Extent	Low	Site-specific affects only the development footprint.
	Medium	Local (limited to the site and its immediate surroundings, including the surrounding towns and settlements within a 10 km radius);
	High	Regional (beyond a 10 km radius) to national.
Duration	Low	0-4 years (i.e. duration of construction phase).
	Medium	5-10 years.
	High	More than 10 years to permanent.
Intensity	Low	Where the impact affects the heritage resource in such a way that its significance and value are minimally affected.
	Medium	Where the heritage resource is altered, and its significance and value are measurably reduced.
	High	Where the heritage resource is altered or destroyed to the extent that its significance and value cease to exist.
Potential for impact on irreplaceable resources	Low	No irreplaceable resources will be impacted.
	Medium	Resources that will be impacted can be replaced, with effort.
	High	There is no potential for replacing a particular vulnerable resource that will be impacted.
Consequence, (a combination of extent, duration, intensity, and the potential for impact on irreplaceable resources).	Low	A combination of any of the following: - Intensity, duration, extent and impact on irreplaceable resources are all rated low. - Intensity is low and up to two of the other criteria are rated medium. - Intensity is medium and all three other criteria are rated low.
	Medium	Intensity is medium and at least two of the other criteria are rated medium.

Criteria	Rating Scales	Notes
	High	Intensity and impact on irreplaceable resources are rated high, with any combination of extent and duration. Intensity is rated high, with all the other criteria being rated medium or higher.
Probability (the likelihood of the impact occurring)	Low	It is highly unlikely or less than 50 % likely that an impact will occur.
	Medium	It is between 50 and 70 % certain that the impact will occur.
	High	It is more than 75 % certain that the impact will occur, or it is definite that the impact will occur.
Significance (all impacts including potential cumulative impacts)	Low	Low consequence and low probability. Low consequence and medium probability. Low consequence and high probability.
	Medium	Medium consequence and low probability. Medium consequence and medium probability. Medium consequence and high probability. High consequence and low probability.
	High	High consequence and medium probability. High consequence and high probability.

3.3 Oral history

Where possible, people from local communities would be interviewed to obtain information relating to the surveyed area.

3.4 Report

The results of the desktop research and field survey are compiled in this report. The identified heritage resources and anticipated direct, indirect, and cumulative impacts that the development of the proposed project may have on the identified heritage resources will be presented objectively. Alternatives, should any significant sites be impacted adversely by the proposed project, are offered. All effort will be made to ensure that all studies, assessments, and results comply with the relevant legislation and the code of ethics and guidelines of the Association of South African Professional Archaeologists (ASAPA). The report aims to assist the developer in managing the documented heritage resources in a responsible manner, and to protect, preserve, and develop them within the framework provided by the National Heritage Resources Act of 1999 (Act 25 of 1999).

4. PROJECT OVERVIEW

UBIQUE Heritage Consultants were appointed by EnviroAfrica cc as independent heritage specialists in accordance with Section 38 of the NHRA and the National Environmental Management Act 107 of 1998 (NEMA), to conduct a cultural heritage assessment to determine the impact of the proposed development of Wegdraai township, on Erven 1, 45 and 47, Wegdraai, Boegoeberg Settlement (Kenhardt), on the Farm Boegoebergnedersetting RE/48 in the !Kheis Local Municipality, on any sites, features, or objects of cultural heritage significance.

The project entails the expansion of the Wegdraai community. A total of 360 new erven will be created. The project includes the formalisation of the existing informal houses located around the town. The size of the study area is 43 ha. Wegdraai is located on the western bank of the Orange River, next to the N10, approximately 14 km northwest of Groblershoop.

The development footprint has been divided into four areas:

- Site I – 21 ha, western section of Erf 45 with Erf 47,
- Site II – 6 ha, northern section of Wegdraai on Erf 1,
- Site III – 1 ha, northeastern section of Erf 45,
- Site IV – 15 ha, southeastern section of Erf 45.

4.1 Technical information

Project description	
Project name	!KHEIS LOCAL MUNICIPALITY TOWNSHIP EXPANSION: WEGDRAAI
Description	The expansion and upgrade of housing and infrastructure at Wegdraai township in the !Kheis Local Municipality and within the ZF Mgcawu District Municipality in the Northern Cape Province. Reference: NC/21/2018/PP
Developer	
!Kheis Local Municipality in cooperation with the Barzani group and Macroplan Regional and Town Planners	
Contact information	Wegdraai Community !Kheis Local Municipality, ZF Mgcawu District Municipality, Northern Cape Province.
Development type	Housing (Township expansion)
Landowner	
!Kheis Local Municipality	
Contact information	054-332 3642 or 054- 833 9500
Consultants	
Environmental	EnviroAfrica cc.
Heritage and archaeological	UBIQUE Heritage Consultants
Paleontological	Banzai Environmental
Property details	
Province	Northern Cape
District municipality	ZF Mgcawu
Local municipality	!Kheis
Topo-cadastral map	1:50 000 2821DD

Farm name	Erf 45, Wegdraai Erf 1, Wegdraai Erf 47, Wegdraai
Closest town	Groblershoop
GPS Co-ordinates	28°50'30.57"S; 21°51'25.96"E, 28°50'13.46"S; 21°52'12.63"E, 28°50'13.70"S; 21°51'44.31"E, 28°50'31.70"S; 21°51'36.16"E.
Property size	
Development footprint size	43 ha
Land use	
Previous	Agriculture
Current	Agriculture and informal housing. Big landfill located on the western edge of Site I.
Rezoning required	Yes
Sub-division of land	Yes
Development criteria in terms of Section 38(1) NHRA	
Construction of a road, wall, power line, pipeline, canal or other linear forms of development or barrier exceeding 300m in length.	Yes
Construction of bridge or similar structure exceeding 50m in length.	No
Construction exceeding 5000m ² .	Yes
Development involving three or more existing erven or subdivisions.	Yes
Development involving three or more erven or divisions that have been consolidated within the past five years.	Yes
Rezoning of site exceeding 10 000m ² .	Yes
Any other development category, public open space, squares, parks, recreation grounds.	No



Figure 1 Proposed township expansion at Wegdraai, !Kheis Local Municipality. Image provided by Macroplan.

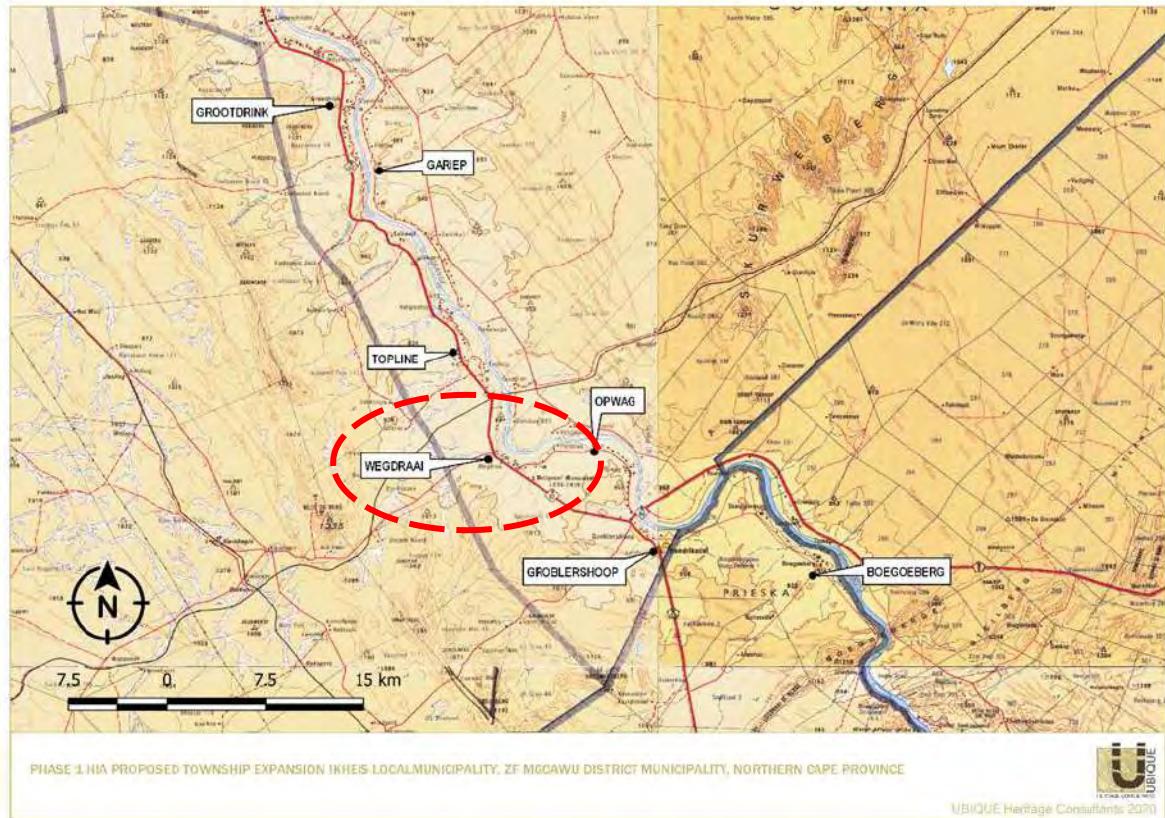


Figure 2 Regional locality of the development footprint, Wegdraai, !Kheis Local Municipality indicated on 1: 250 000 WGS2820-2920.

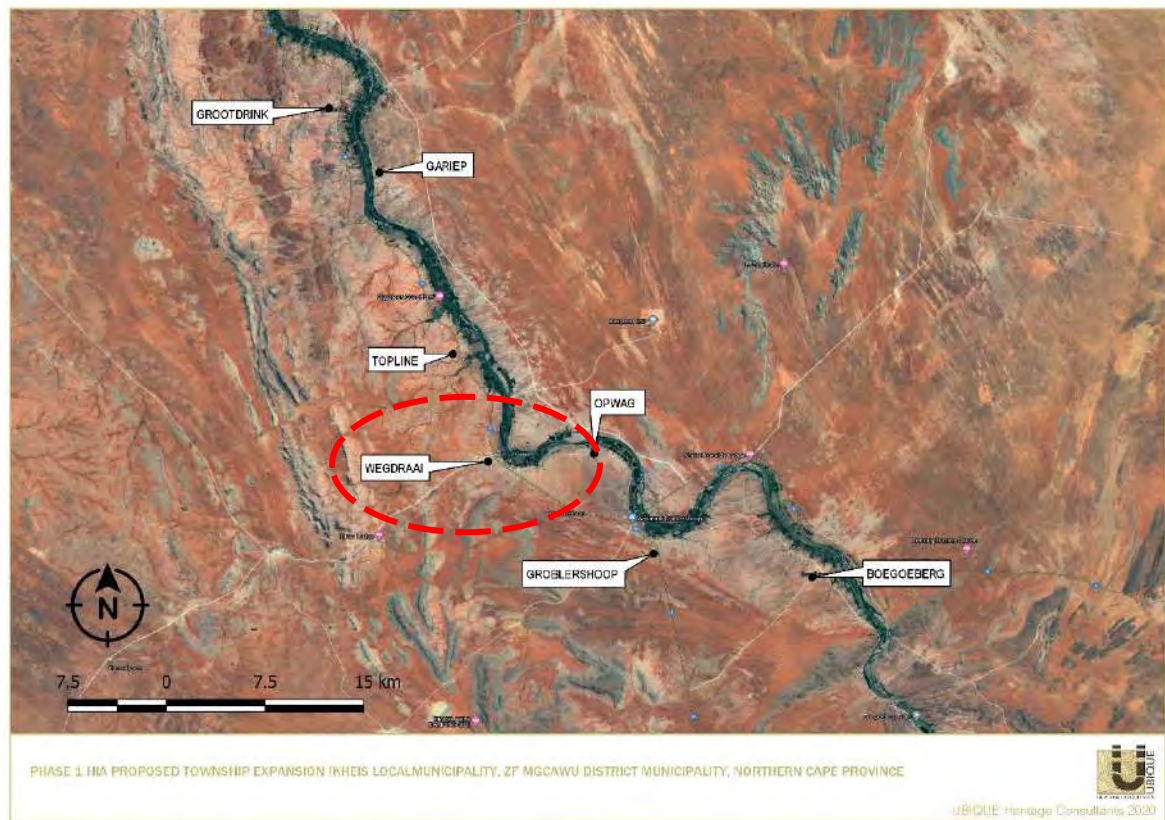


Figure 3 Regional locality of the development footprint, Wegdraai, !Kheis Local Municipality indicated on Google Earth Satellite imagery.

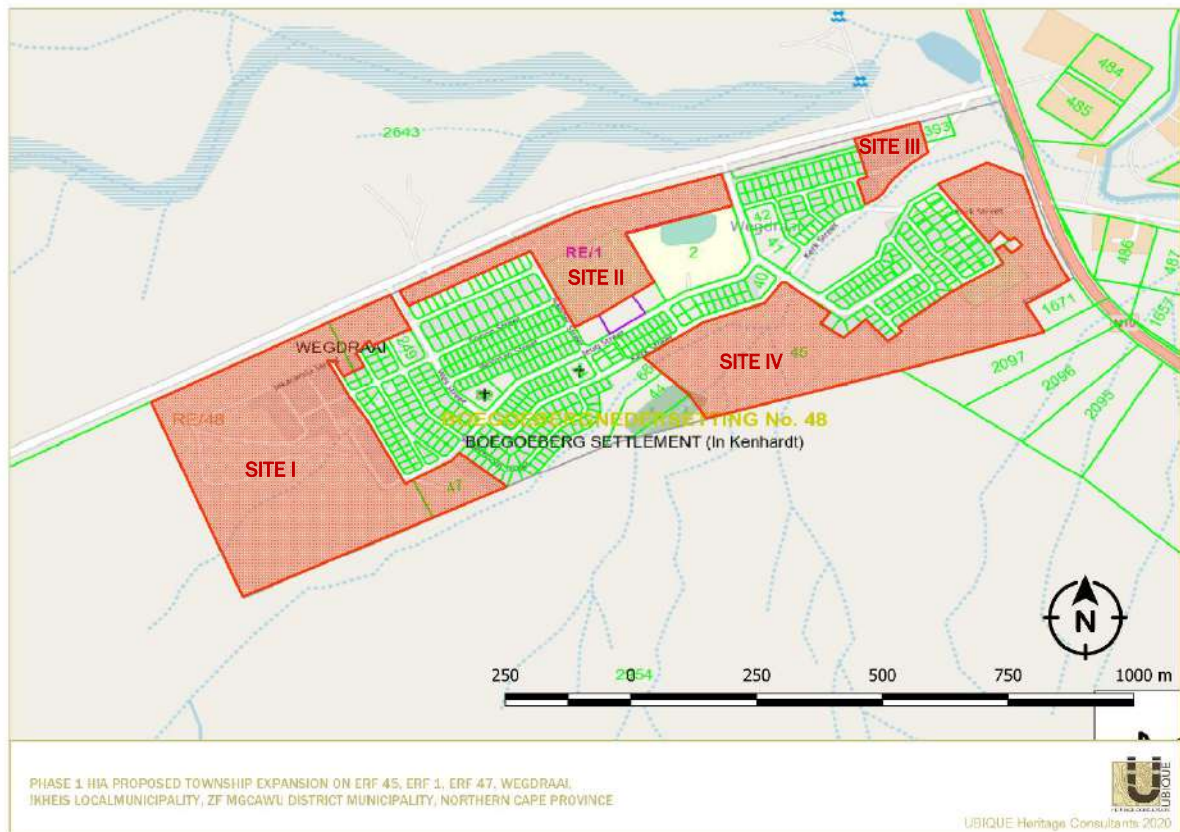


Figure 4 Locality of the development footprint, Wegdraai, !Kheis Local Municipality indicated on Chief Surveyor-General ArcGIS Web Map (source <https://csg.esri-southafrica.com/>)



Figure 5 Locality of the development footprint Wegdraai, !Kheis Local Municipality indicated on Google Earth Satellite imagery.

4.2 Description of the affected environment

The development area falls within Bushmanland Arid Grassland. It is characterised by extensive to irregular plains on a slightly sloping plateau. The white grass (*Stipagrostis* species) dominated grassland gives this vegetation type the character of semidesert 'steppe'. In places, low shrubs of *Salsola* change the vegetation structure. Vegetation identified in the development footprint includes camel thorn trees (*Acacia erioloba*), blackthorn trees (*Acacia mellifera*), silky bushman grass (*Stipagrostis uniplumis*), three thorn/driedoring (*Rhigozum trichotomum*), skaapbossie (*Aizoon schellenbergii*), shepherd tree (*Boscia albitrunca*), suurgras (*Enneapogon desvauxii*), tall bushman grass (*Stipagrostis hirtigluma*), silky bushman grass (*Stipagrostis uniplumis*), kortbeen boesmangras (*Stipagrostis obtuse*), pencil milkbush (*Euphorbia lignose*), Aloe (*Aloe argenticuada*), and *Prosopis* (*Prosopis glandulosa*). The soils of the area are mostly red-yellow freely drained apedal soils (Mucina & Rutherford 2006). There are deposits of banded ironstone formation (BIF), calcrete, quartz and quartzite on the surface.

The study area consists of flat open vacant fields with a few trees scattered throughout the footprint. The entire terrain slightly slopes towards the east, in the direction of the existing settlement and the N10. The development footprint is bounded in the north by Kleinbegin secondary gravel road running towards the west, south, and west by vacant land, and in the east, by the N10. There is at least one dry riverine flowing from west to east through the footprint Site I. At least three dry riverine flow from southwest to northeast through footprint Site IV. Some of the dry riverine eroded into large furrows, especially in the central-east and south-eastern parts of the footprint. Several areas have minor damage due to water erosion. Anthropogenic disturbances are prevalent throughout the footprint, such as dumping sites for garbage, rubble, stone, and soil. Evidence of construction earthmoving machinery is visible in certain areas, especially on Site II. Informal housing exists on parts of the development footprint.

Figure 6 Views of the affected development area.





5. HISTORICAL AND ARCHAEOLOGICAL BACKGROUND

5.1 Region

The Northern Cape is rich in archaeological sites and landscapes that reflect the complex South African heritage from the Stone Age to Colonial history.

5.1.1 Stone Age

The Stone Age is the period in human history when lithic material was mainly used to produce tools (Coertze & Coertze 1996). In South Africa, the Stone Age can be divided into three periods. It is, however, important to note that dates are relative and only provide a broad framework for interpretation. The division of the Stone Age, according to Lombard et al. (2012) is as follows:

Earlier Stone Age:	>2 000 000 - >200 000 years ago
Middle Stone Age:	<300 000 - >20 000 years ago
Later Stone Age:	<40 000 - until the historical period.

In short, the Stone Age refers to humans that mainly utilised stone as their technological marker. Each of the sub-divisions represents a group of industries where the assemblages share attributes or common traditions (Lombard et al. 2012). The ESA is characterised by flakes produced from pebbles, cobbles, and percussive tools, as well as objects created later during this period such as large hand axes, cleavers, and other bifacial tools (Klein 2000). The MSA is associated with small flakes, blades, and points. The aforementioned are commonly inferred to have been made and utilised for hunting activities and had numerous functions (Wurz 2013). Lastly, the LSA is characterised by microlithic stone tools, scrapers, and flakes (Binneman 1995; Lombard et al. 2012). The LSA is also associated with rock art. Numerous LSA rock art sites, mainly in the form of rock engravings and paintings have been identified in the Northern Cape (Beaumont 2008; Kruger 2018; Morris 1988). These sites are commonly found on slopes, hilltops, rocky outcrops and occasionally in riverbeds (Kruger 2018). Banded ironstone occurs on several sites throughout the Northern Cape and appears to have been a favoured raw material for making stone tools due to its superior flaking qualities (Morris 2012). Prominent sites that exemplify these periods in the Nama-Karoo Biome are Rooidam and Bundu Farm (Earlier Stone Age and Middle Stone Age), and Biesje Poort 2, Bokvasmaak 3, Melkboom 1, Vlermuisgat, and Jagtpan 7 (Later Stone Age) (Lombard et al. 2012).

Within the region, Stone Age sites and complexes have been, and are still being investigated in some detail. For instance, in the Kathu landscape, the longest preserved lithostratigraphic and archaeological sequence of human occupation has been documented and excavated. Evidence of 500 000-year-old hafted stone points, ancient specularite working (and mining), and associated Ceramic Later Stone Age material have been recorded on the eastern side of Postmasburg and Doornfontein. Older transitional ESA/MSA Fauresmith sites at Lyly Feld, Demaneng, Mashwening, King, Rust & Vrede, Paling, Gloucester and Mount Huxley have been recorded (Beaumont 2004; Beaumont 2013; Beaumont & Morris 1990; Beaumont & Vogel 2006; Morris 2005; Morris & Beaumont 2004; Porat et al. 2010; Thackeray et al. 1983; Walker et al. 2014; Wilkins et al. 2012).

Beaumont et al. (1995) commented that thousands of square kilometres of Bushmanland are covered by low-density lithic scatters. It is therefore not surprising that Stone Age sites and lithic scatters were identified by CRM practitioners between the Garona substation and the Gariep/Orange River in numerous surveys conducted during the recent years. Scatters of MSA material have been recorded close to Griekwastad, Hotazel, Postmasburg and Kenhardt, Pofadder, Marydale, and in the Upington district (Dreyer 2006, 2012, 2014; Pelsers & Lombard 2013; PGS Heritage 2009, 2010; Webley 2013). MSA and LSA tools, as well as rock engravings, were also found at Putsonderwater, Beeshoek and Bruce (Morris 2005; Snyman 2000; Van Vollenhoven 2012b; Van Vollenhoven 2014).

Archaeological surveys have shown that rocky outcrops, hills, drainage lines, riverbanks and confluences, are prime localities for archaeological finds (Lombard 2011). Sites can likewise be found close to local sources of highly prized raw materials such as previously mentioned banded iron formations (BIF), as well as jasperite and specularite (Morris 2012; Kruger 2015; 2018). If any such features occur in the study area, Stone Age manifestations can be anticipated.

5.1.2 Iron Age

The Iron Age (IA) is characterised by the use of metal (Coertze & Coertze 1996: 346). There is some controversy about the periods within the IA. Van der Ryst & Meyer (1999) have suggested that there are two phases within the IA, namely:

- Early Iron Age (EIA) 200 – 1000 AD
- Late Iron Age (LIA) 1000 – 1850 AD

However, Huffman (2007) suggests instead that there are three periods within the Iron Age; these periods are:

- Early Iron Age (EIA) 250 – 900 AD
- Middle Iron Age (MIA) 900 – 1300 AD
- Late Iron Age (LIA) 1300 – 1840 A.D

Thomas Huffman believes that a Middle Iron Age should be included within this period. His dates have been widely accepted in the IA field of archaeology.

The South African Iron Age consists of farming communities who had domesticated animals, cultivated plants, manufactured, and made use of ceramics and beads, smelted iron for weapons and manufactured tools (Hall 1987). Iron Age people were often mixed farmers/agropastoralists. These agropastoralists generally chose to live in areas with sufficient water for domestic use along with arable soil that could be cultivated with an iron hoe. Most Iron Age (IA) settlements were permanent settlements, consisting of features such as houses, raised grain bins, storage pits and animal kraals/byres this is in contrast to the temporary camps of pastoralists and hunter-gatherers (Huffman 2007). It is evident in the archaeological record that IA groups had migrated with their material culture (Huffman 2002).

The majority of the IA groups in southern Africa preferred to occupy the central and eastern parts of southern African from about 200 AD. The San and Khoi remained in the western and southern parts (Huffman 2007; Van Vollenhoven 2014). IA sites are scarce, but not unheard-of in the Northern Cape. IA sites have predominantly been recorded in the northeastern part of the province. Kruger (2018) suggested that environmental factors delegated the spread of IA farming westwards during the 17th century. Settlement in the Northern Cape was constrained mainly to the areas east of the Langeberg Mountains. The Later Iron Age (LIA) was accompanied by extensive stone walled settlements, such as the Thlaping capital Dithakong, approximately 40 km north of Kuruman (De Jong 2010). The Sotho-Tswana and Nguni speaking societies, who are the descendants of the LIA mixed farming communities, moved into a region already sparsely inhabited by LSA Khoisan groups. De Jong (2010) commented that LIA communities eventually assimilated many LSA Khoisan groups, and only a few had managed to survive independently. Some of the surviving groups included the Koranna and the Griqua. This period of contact has often been referred to as the Ceramic LSA. It is represented by sites such as the earlier mentioned Blinkklipkop specularite mine near Postmasburg and Kathu Pan (De Jong 2010). LIA people briefly utilised the area close to the Orange River in the Northern Cape, mining copper, and there is even evidence of an IA presence as far as the Upington area in the 18th century (Kruger 2018; Van Vollenhoven 2014).

5.1.3 Historical period

The historical period within the region coincides with the incursion of white traders, hunters, explorers, and missionaries into the interior of South Africa. Buildings and structures associated with the early missionaries, travellers, and traders such as PJ Truter's and William Somerville (arriving in 1801), Donovan, Burchell and Campbell, James Read (arriving around 1870) William Sanderson, John Ryan and John Ludwig's (De Jong 2010; Snyman 2000) arrival during the 19th century, and the settlement of the first white farmers and towns, are still evident in the Northern Cape. Numerous heritage reports that provide a synthesis of the incursions of travellers, missionaries and the early European settlers have been captured on the SAHRIS database.

San hunter-gatherer groups utilised the landscape for thousands of years, and Khoi herders moved into South Africa with their cattle and sheep approximately 2000 years ago. With the arrival of the Dutch settlers in the Cape in the mid-17th century, clashes between the Europeans and Khoi tribes in the Cape Peninsula resulted in the Goringhaiqua and Goraxouqua migrating north towards the Gariep/Orange River in 1680. These tribes became collectively known as the Korannas, living as small tribal entities in separate areas (Penn 2005).

Because of its distance from the Cape Colony, this arid part of South Africa's interior was generally not colonised until relatively recent. According to history, the remote northern reaches of the Cape Colony were home to cattle rushers, gunrunners, river pirates and various manner of outlaws. Distribution of land to colonial farmers only occurred from the 1880s onwards when Government-owned land was surveyed, divided into farms, and transferred to farmers. More permanent large-scale settlement however only started in the late 1920s, and the first farmsteads were possibly built during this period. The region remained sparsely populated until the advent of the 20th century (De Jong 2010, Penn 2005).

The region has been the backdrop to various incidents of conflict. Numerous factors such as population growth, increasing pressure on natural resources, the emergence of power blocs, attempts to control trade, and the emergence of the Griquas, and penetration of the Koranna and early white communities from the south-west resulted in a period of instability in the Northern Cape. With the introduction of loan farms, in the second half of the 18th century, an influx of newcomers such as trekboers, European game hunters and livestock thieves contributed to the volatility and sociocultural stress and transformation in the region (Mlilo 2019).

The *Difaqane/Mfecane*, which began in the late-18th century, affected the Northern Cape Province around 1820, which was much later than the rest of southern Africa (De Jong 2010; Mlilo 2019). During this time, there was an incursion of displaced refugees associated with the Fokeng, Tlokwa, Hlakwana and Phuting groups into the northeast (De Jong 2010). The arrival of large numbers of Great Trek Boers from the Cape Colony to the borders of Bechuanaland and Griqualand West in 1836 caused friction with many Tswana groups and the missionaries of the London Mission Society. The conflict between Boer and Tswana communities escalated in the 1860s and 1870s when the Koranna and Griqua communities and the British government became involved. The Koranna wars took place during 1879-1880.

According to Breutz (1953, 1954), and Van Warmelo (1935), several Batswana tribes, including the different Thlaping and Thlaro sections as well as other smaller groups, take their 18th and 19th-century roots back to the area around Groblershoop, Olifantshoek, the Langeberg (Majeng) and Korannaberg ranges in the western part of the region. After Britain annexed Bechuanaland in 1885, the land of the indigenous inhabitants was limited to a few reserves. After the failed Tswana revolt in 1895, the British continued to divide the Tswana land up, and grant it to settling colonial farmers.

The Northern Cape was critical in the Anglo-Boer War (1899-1902), and significant battles took place within 120 km of Kimberley, including the battle of Magersfontein. Boer guerrilla forces roamed the entire Northern Cape region and skirmishes between Boer and Brits were regular occurrences. Furthermore, many graves in the region tell the story of battles fought during the 1914 Rebellion (Hopkins 1978).

5.2 Local

During 1778, Swedish-born traveller and explorer Hendrik Wikar reached the middle and lower reaches of the Orange River after a long land journey that started in Cape Town. As a deserter from the service of the Dutch East India Company, Wikar spent several years within the area and compiled a report of his experiences in exchange for a pardon (Ross 1975). He documented his encounters with Khoisan communities who called themselves the *Einiqua*, or *River People*. The *Einiqua* were divided into three “kraals”: the *Namnykoa* near the Augrabies Falls, the *Kaukoa* on islands west of Keimoes, and the *Aukokoa* of Kanoneiland and other islands to the east. Their kraals consisted of a considerable amount of sheep and cattle, and they collected plants, hunted game, and cultivated dagga but no other crops, according to Wikar (Ross 1975). Amongst the

pastoralist communities living on the islands were the *Anoe eis* people whom Wikar characterised as “Bushmen”. They possessed no domesticated stock, subsisted by fishing, game-trapping, hunting and the gathering of plant foods (Morris & Beaumont 1991). Colonel Robert Jacob Gordon who visited the area in 1779, however, remarked that they were actually *Einiqua* (i.e. Khoi) who had “lost their cattle as a result of an argument with the *Namneiqua* village (Morris & Beaumont 1991). The San and Khoekhoe hunter-gatherers in the region had reached a form of stability by the early 18th century (Mlilo 2019). The area west of the Langeberg and east of Upington was occupied by IA groups such as the BaTlaping. Their influence had reached as far down the river as Upington (Morris 1992).

By the 18th century, the *Basters* had focused on the Orange River (and Namaqualand) as destinations of sanctuary from colonial rule and social oppression present in the Cape Colony (Mlilo 2019; Van der Walt 2015). The term “Baster” characterises a group of people of mixed percentage (white and Khoekhoe or slave and Khoekhoe) who possessed property and who was culturally European. In 1882, the first 81 farms north of the Gariep/Orange River between Groblershoop and the Augrabies Falls were allocated almost exclusively to *Basters* (Morris 1992). During the late 19th century, more white people started moving to the Gordonia area, and by the turn of the century, some 13 Afrikaner families had settled at Keimoes (De Beer 1992; Van der Walt 2015). The aftermath of the scorched earth policy of the South African War (Anglo-Boer War), resulted in many farmers moving to new areas, in search of greener pastures, and settlement next to the Gariep/Orange River provided ample irrigation for one’s crops.

Since the 1880s, the irrigation of the Orange River played a central role in the economic advancement of the area around Upington (Legassick 1996). The development of the canal systems was integral in irrigating extensive vineyards and orchards and the expansion of substantial agricultural enterprises within the area (Engelbrecht & Fivaz 2018). Dutch Reformed Church missionary Reverend C.H.W. Schröder and Special Magistrate for the Northern Border John H. Scott, are credited with formalising and extending the irrigation system. However, when Schröder first came to Upington in July 1883, there were already people in the area of Keimoes that used irrigation and planted fields. Moolman (1946) and Legassick (1996) mentions how the *Baster* farmers diverted river water to their gardens, albeit crudely. The *Basters’* irrigation scheme has been attributed to the ingenuity of Abraham September. Legassick (1996) commented that “the small, white-painted, stone house where Abraham September lived when he undertook this work survives to this day, though the house and the land upon which it stands have long passed from the hands of the September family”.

The early Portuguese sailors referred to the Gariep/Orange River as the St Anthonio, and Simon van der Stel marked it as the Vigi Magna on maps from 1685. The elephant hunter Jacobus Coetzee called it the “*de Groote Rivier*” (the Great River) in 1760 and land-surveyor Carel Brink noted in 1761 that the river is known to the local island inhabitants as the Tyen Gariep (*Our River*). The missionary Campell also spoke of the Gariep, Gareeb, and Garib, as the name the Korannas used. On the evening of 17 August 1779, Robert Gordon took his rowboat out to the middle of the river, raised and toasted the Netherland’s flag, and proclaimed the river in the name of the Prince van Oranje. Maps from this date forward name the river as the Orange River (Oranjeriver), but colloquially it is still known as the Gariep or Grootrivier. !Kheis Municipality is named in recognition

of the first permanent residents of the area. !Kheis is a Khoi name meaning "a place where you live", or "a home".

De Jong (2010) classifies the cultural landscape along the Gariep/Orange River as predominantly historic farmland. In the Lower Orange River environment, farms display heritage features that typically occur in the district, such as their large size, irrigation furrows and pipelines, fences, tracks, farmsteads, and irrigated fields. Farmsteads are clustered close to rivers and primary roads (De Jong 2010). According to De Jong (2010), this class of landscape is of relatively low heritage sensitivity because it can absorb adverse effects of new development through some mitigation.

5.3 Topline (Saalskop), Wegdraai, Opwag, Groblershoop, Boegoeberg (Brandboom)

Various HIA and AIA reports have been conducted in and around the vicinity of Groblershoop, Boegoeberg, Opwag, Topline and Wegdraai study areas. These include, but are not limited to, the farms situated around the study areas. These farms include Buchuberg 263, Farm 292, Farm 387 Sanddraai 391, Bokpoort 390 and Kleinbegin 115.

5.3.1 Stone Age

The distribution of archaeological sites in the area has been characterised by Morris (2012) as stone artefacts along the Orange River; stone artefacts situated on the calcrete plain east of the Orange River; stone artefact scatters between dunes. Scatters of stone artefacts in and around the Groblershoop- Boegoeberg area have been reported by Beaumont (2008), Engelbrecht & Fivaz (2019) Dreyer (2006, 2012, 2013, 2015), Morris (2006, 2007, 2012, 2014), Orton & Webley (2013), Van der Walt (2012); Van Ryneveld (2007), Van Schalkwyk (2011, 2020), Van Vollenhoven (2014), and Webley (2013). The lithics that have in the area have been attributed to the ESA, MSA, and the LSA. Raw materials include chalcedony, jasperlite, quartzite and banded ironstone formation (BIF), as well as meta-quartzite. These scatters of lithics generally have little to no context. Predominantly heritage reports describe the recorded stone artefacts in the area to be of poor preservation and with limited heritage significance.

During his survey on the Farms Sanddraai and Bokpoort, situated in the vicinity of Saalskop (Topline) and Wegdraai, Morris (2012) reported MSA materials scattered amongst the calcrete surface deposits at the edges of borrow pits along the Loop 16 on the Sishen-Saldanha railway line. Dreyer's (2012) survey documents a single scatter of worked chalcedony, BIF, quartz and meta-quartz artefacts near a calcrete outcrop, with a substantial collection of flakes on the slopes along the River at Sanddraai.

Engelbrecht & Fivaz (2019) documented several MSA and LSA scatters on Farm 387, Portion 18, Groblershoop. Apart from low-density MSA and LSA artefact scatters, they documented moderate to high densities of MSA/LSA open lithic scatters with flakes, scrapers, cores, microliths and

incidences of local ceramics. Two sites recorded next to the Orange/Gariep River are probable hunter/herder sites, while five sites located on the dunes are believed to be knapping sites (Engelbrecht & Fivaz 2019). On the Farm 292 located near Groblershoop, Beaumont (2008) found low densities of Stone Age artefacts. On a section of Farm 387 Webley (2013) recorded background scatters of MSA artefacts of quartzite and BIF cobbles throughout the study area.

The majority of the artefacts across the landscape are randomly scattered. Nevertheless, it has been found that dense scatters of artefacts appear on and around small koppies. Several MSA and LSA stone artefact scatters have been identified on the eastern margins of the Orange River, Groblershoop (Webley 2013). The informally flaked hornfels cobbles and quartz flakes recorded along the shore may indicate the presence of LSA occupations (Webley 2013). The LSA scatters on the eastern shore, are believed to be of medium significance as they can potentially inform us “on hunter-gatherer and pastoralist settlement patterns along the River” (Webley 2013).

In Orton & Webley's (2013) report for the proposed Boegoeberg Hydropower station approximately 14.6 - 24 km south/southeast from the Brandboom/Boegoeberg study area, they mention several exciting finds. They found a small ephemeral archaeological Later Stone Age site on the sandy floodplain just downstream of the Boegoeberg Dam/Weir. This site consisted of a scatter of rocks that may likely have been used to anchor a hut, in association with two artefacts and one fragment of OES (Orton & Webley 2013). Orton & Webley (2013) recorded a cluster of stone walls on the south side of the river and the mountain slope close to the power line crossing point. The presence of pre-colonial stonewalling in the Groblershoop and Boegoeberg study areas is rare. This archaeological site is approximately 17 km from the Brandboom/Boegoeberg study area. The features included straight walls, semi-circles, L-shapes, and small mounds of rocks. Very little associated archaeological material was discovered on the surface. They note in the report that these stone walls are typical of pre-colonial walling from the Karoo and some may have been hunting blinds. They also documented scatters of MSA stone artefacts above the cliff at Boegoeberg Weir/Dam, and a few LSA grindstones and other isolated artefacts in the area.

5.3.2 Historical period

It was around 1870 that the first Colonial farmers had settled in the Groblershoop area (Orton & Webley 2013). The town of Groblershoop originally developed on the farm Uitdraai (Engelbrecht & Fivaz 2019). Military topographic maps from 1908 and 1913 show a sparsely populated area, with numerous tracks across the sandy plains. There were halts situated at Zaalskop, Wegdraai, Uitdraai, Winstead and a hotel at Dabep. Access to water at Wegdraai was via a steep and narrow approach, at Uitdraai, there were a large well and tank situated underneath the house and a store where a supply of forage could be obtained. A weir was constructed across the Orange River at Buchberg, with a turbine historic water turbine driven by solid-oak gears in the Orange River on the Farm Winstead. This historic water turbine was built in 1913 (Engelbrecht & Fivaz 2019). All along the eastern shore of the Orange River, locations of “native huts and kraals” are indicated.

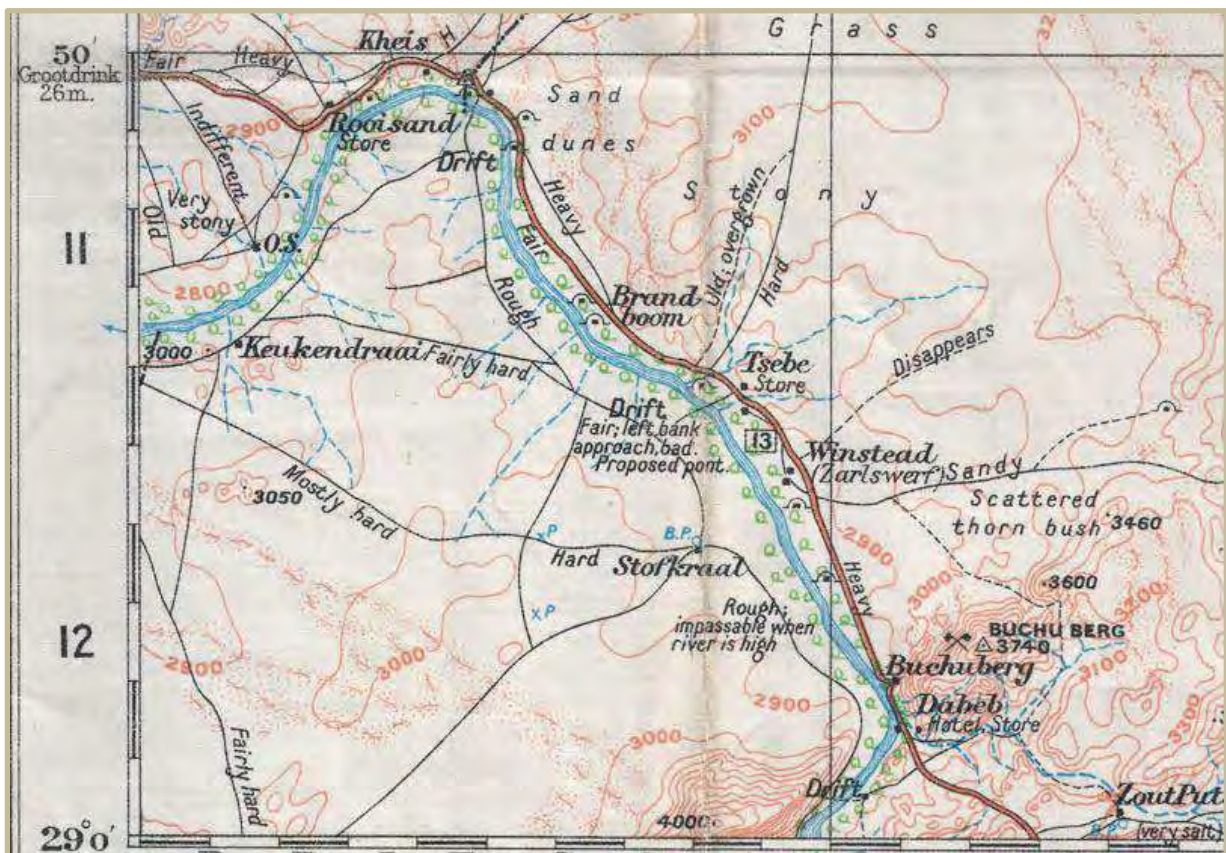
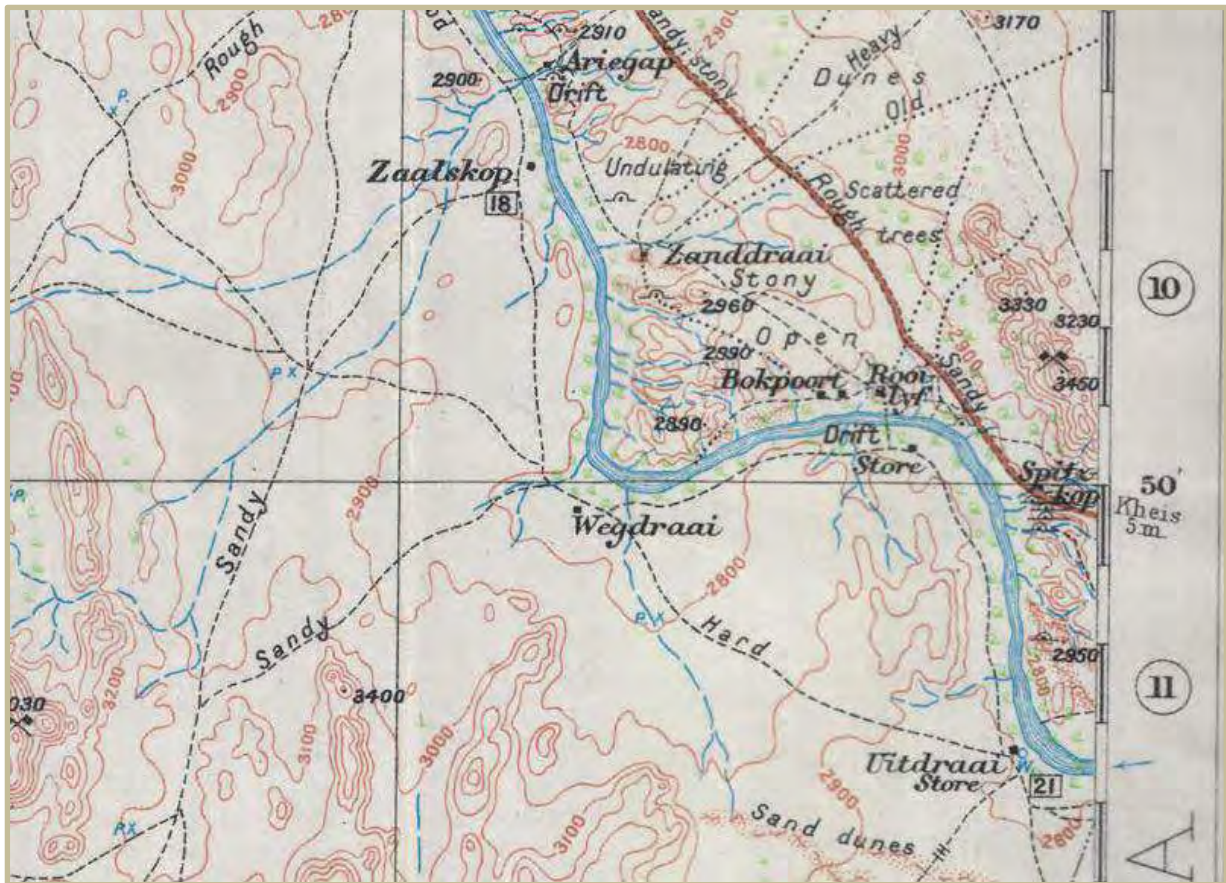


Figure 7 Detail of 1913 Topographical map of Upington, and detail of 1914 topographical map of Langeberg, available at <https://digitalcollections.lib.uct.ac.za/>

Groblershoop developed as a result of the development of the Boegoeberg Dam and water channels in 1929 (Van Schalkwyk 2019; 2020). The town was initially known as Sternham, with the first house dating to 1912. In 1935, the town was renamed to Groblershoop, after a former Minister of Agriculture: Mr PGW Grobler. Mr Grobler assisted in the development of the Boegoeberg Dam and the irrigation project in 1929. He had played a substantial role in this development and creating employment for the poor-white community and boosting progress in the region (Engelbrecht & Fivaz 2019). The idea for the construction of the weir and irrigation canal was first considered in 1872. Proposals for the project was rejected in 1896, and again in 1907, for being too expensive (Orton & Webley 2013). After about 20 years of preparatory work, the construction of the Boegoeberg Dam began in May 1929. The dam was completed in 1932, and the canal in 1934. Even children as young as nine years old were employed to work on the construction of the dam and irrigation canals. It is believed that about 50 people (39 being children) died during the construction of the project (Orton & Webley 2013). The Boegoeberg Dam itself is a significant heritage structure (Orton & Webley 2013).

Minimal artefacts and structures dating to the historical/colonial period have been recorded on sites in the vicinity of the Groblershoop and Brandboom/Boegoeberg study areas or on the farms surrounding Topline (Saalskop), Wegdraai, and Opwag. Nevertheless, AIA and HIA reports state that it is not uncommon to find colonial-era builds/artefacts in the area. Morris (2012) noted colonial-era traces such as the agricultural modification of the riverbank, a railway bridge, and a stone structure, close to the Orange River, on the farms of Sanddraai 391 and Bokpoort 390. During Webley's (2013) survey for the proposed construction of the Eskom Groblershoop Substation and the Garona-Groblershoop 132 kV powerline, she found a stone reservoir (25m x 25m) lined with plaster, with a gutter made of stone running around the margins to collect water. She notes that there were various rusted farm implements nearby (Webley 2013). Orton & Webley (2013) have noted that there are a few farm buildings in the area, such as a house dating to the late-19th or early-20th century, considered to be of high heritage significance. Another structure, built with traditional materials like sun-dried bricks, mud and mortar, plastered in modern cement in 1956 (date inscribed by the entrance steps) was documented.

5.2.3 Graves and Burials

During the construction of the Boegoeberg Dam, severe gastroenteritis and malaria resulted in the deaths of many children. Most of the headstones in the cemetery at the dam mark children's graves (<https://graves-at-eggse.org>). Orton & Webley (2013) recorded an informal graveyard alongside the access road to Zeekoebaart. An isolated grave about one metre off the edge of the road, as well as two isolated graves in the sandy floodplain just downstream of the weir was also documented (Orton & Webley 2013). Several graves dating to the Second Anglo Boer War (1899-1902), belonging to the Dragoon mounted infantry unit, are present in the area (Van Vollenhoven 2014). Seven graves dating to the 1914 Rebellion have been recorded about 25 km from Groblershoop on the road to Griquastad (Webley 2013).

In 1956 Senator A. S. Brink of Keimoes had donated archaeological objects to the South African Museum in Cape Town. Rudner (1971) wrote that the majority of the objects were found in 1934

on the former farm Grootdrink, between Upington and Prieska, during the construction of an irrigation canal from the Boegoeberg Dam. On the southern bank of the river, the flooding of the canal exposed old burials. The human remains were buried in a squatting (crouching) position with their arms folded in front of the legs. Along with the graves, several ostrich eggshell (OES) flasks, one filled with powdered specularite iron, OES beads and bored stone (one of them heart-shaped), several pots and other objects were discovered (Rudner 1971).

5.2.4 Oral history

No interviews with locals were conducted regarding the history of the area.

6. IDENTIFIED RESOURCES AND HERITAGE ASSESSMENT

6.1 Surveyed area

The area surveyed for the impact assessment was dictated by the Google Earth map of the development footprints provided by the client.

The pedestrian survey was conducted in predominantly 40-50 m transects. Areas that have been severely disturbed were surveyed in wider transects. The survey extended beyond the development footprints to take into consideration the full impact of the development by investigating probable areas on the landscape adjacent to the development footprints that may contain heritage.

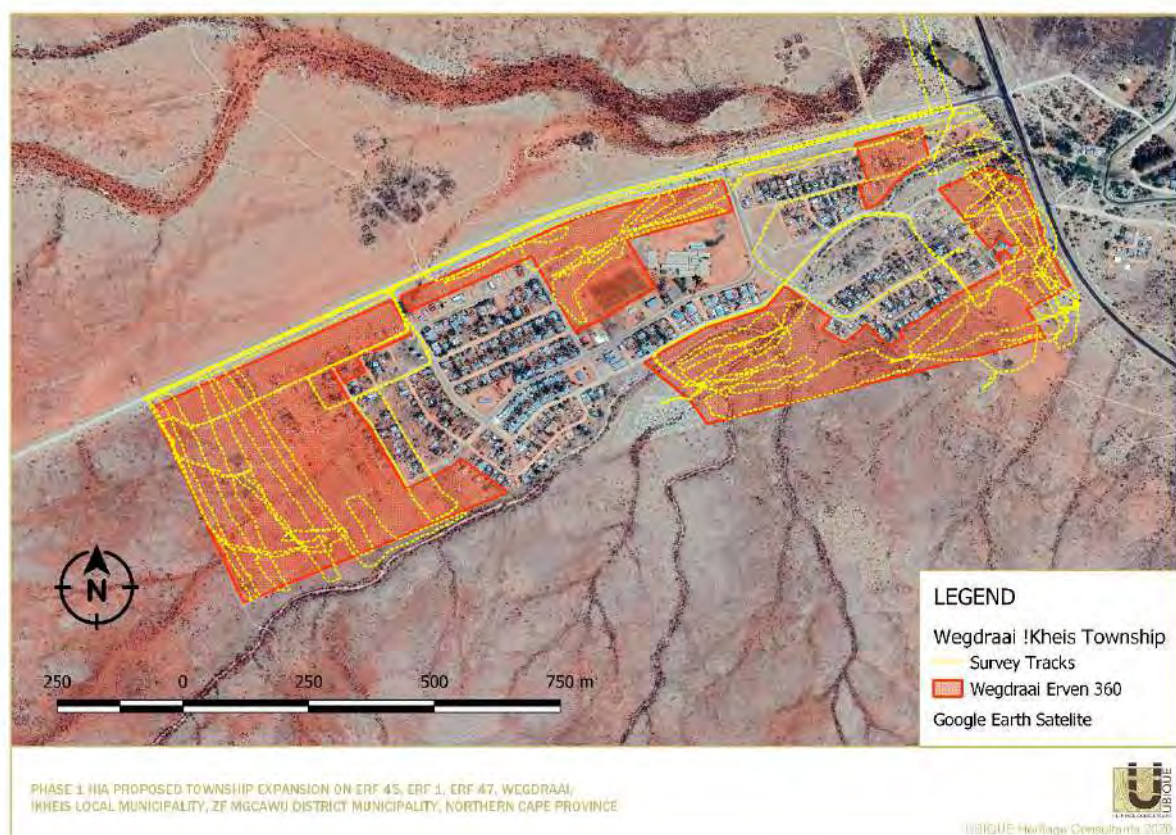


Figure 8 Survey tracks across the development footprint.

6.2 Identified heritage resources

HERITAGE RESOURCES RECORDING

Stone Age Resources Identified

Point ID & Site Name	Description	Period	Location	Field rating/ Significance/ Recommended Mitigation
WP 033 WGD004 Boegoeberg Settlement RE/48/RE1	Type lithic/s	ESA/ MSA	28° 50' 14.2" S 21° 51' 48.0" E	Field Rating IV C
	Raw material			Low significance
	N in m².			No mitigation
	Context			
	Additional			
WP 034 WGD005 Boegoeberg Settlement RE/48/45	Type lithic/s	ESA/ MSA	28° 50' 35.5" S 21° 51' 25.8" E	Field Rating IV C
	Raw material			Low significance
	N in m².			No mitigation
	Context			
	Additional			
WP 037 WGD006 Boegoeberg Settlement RE/48/45	Type lithic/s	ESA/ MSA	28° 50' 35.5" S 21° 51' 25.8" E	Field Rating IV C
	Raw material			Low significance
	N in m².			No mitigation
	Context			
	Additional			
WP 039 WGD007 Boegoeberg Settlement RE/48/45	Type lithic/s	ESA/ MSA	28° 50' 23.4" S 21° 52' 03.0" E	Field Rating IV C
	Raw material			Low significance
	N in m².			No mitigation
	Context			
	Additional			
WP 040 WGD008 Boegoeberg Settlement RE/48/1671	Type lithic/s	ESA/ MSA	28° 50' 18.1" S 21° 52' 22.8" E	Field Rating IV C
	Raw material			Low significance
	N in m².			No mitigation
	Context			
	Additional			
WP 042 WGD009 Boegoeberg Settlement RE/48/45	Type lithic/s	ESA/ MSA	28° 50' 24.19" S 21° 51' 55.58" E	Field Rating IV C
	Raw material			Low significance
	N in m².			No mitigation
	Context			
	Additional			

Graves Identified

Point ID & Site Name	Description	Period	Location	Field rating/ Significance/ Recommended Mitigation
WP 036 WGD001	Grave markers	Cemetery	28° 50' 24.1" S	Field Rating of Local Grade IIIB

Boegoeberg Settlement RE/48/2954	Inscription	Cemetery	1960's to current	21° 52' 16.1" E	High/medium significance Mitigation Required
	Graves' Orientation	East/West			
	Dimensions/Extent	Approximately 2-3 ha. Partly outside development footprint.			
	Additional	Wegdraai official cemetery			
WP 038 WGD002 Boegoeberg Settlement RE/48/44-45	Grave Markers	Cemetery	1960's to current	28° 50' 26.1" S 21° 51' 56.1" E	Field Rating of Local Grade IIIB High/medium significance Mitigation Required
	Inscription	Cemetery			
	Graves' Orientation	East/West			
	Dimensions/Extent	Approximately 1-2 ha. (Partly) outside development footprint.			
	Additional	Wegdraai official cemetery			
WP 041 WGD003 Boegoeberg Settlement RE/48/45	Grave Markers	Cemetery	1960's to current	28° 50' 25.4" S 21° 51' 52.3" E	Field Rating of Local Grade IIIB High/medium significance Mitigation Required
	Inscription	Cemetery			
	Graves' Orientation	East/West			
	Dimensions/Extent	Approximately 1-2 ha. (Partly) outside development footprint.			
	Additional	Wegdraai official cemetery			

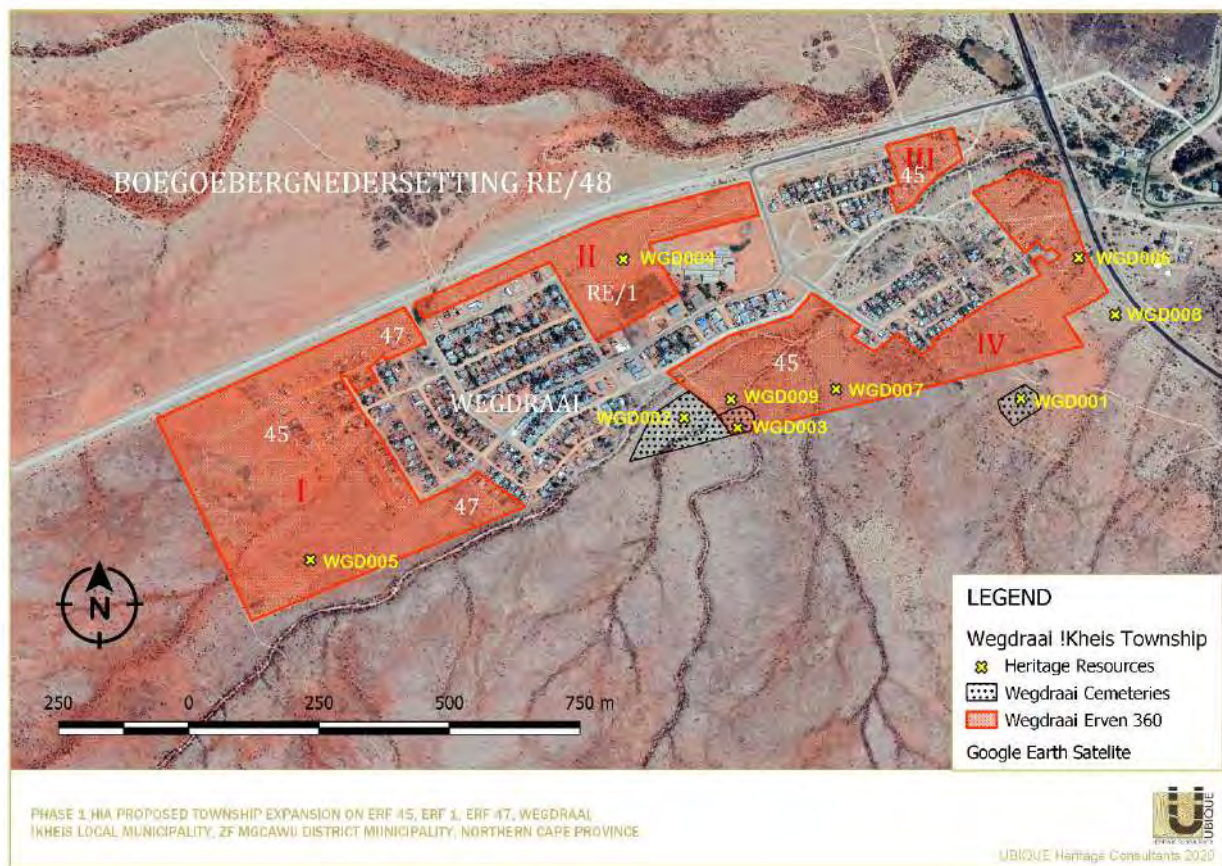


Figure 9 Distribution of identified heritage resources across Wegdraai township, Farm Boegoebergnedersetting No. 48.

6.3 Discussion

6.3.1 Archaeological features

A total of six occurrences of background scatter lithic material was found across the surveyed area. One low-density scatter was recorded across Site I on Erf 45 (WGD005), and one on Site II on Erf 1 (WGD004). Three incidences of lithic material were recorded in the southeastern section of Erf 45 on Site IV (WGD006, WGD007, WGD009), and one low-density scatter was recorded outside the development footprint on Erf 1671. The lithic assemblages consist predominantly of informal tools such as knapping debitage like chunks, chips, and flakes, with cores, and a few scrapers and one bladelet. The raw material, banded ironstone formation (BIF), is readily available throughout the area. The identified archaeological sample is small, of low significance, and therefore of little scientific value. The cultural material may either be a representation of the transition between ESA and MSA, or a mere mixture of ESA and MSA artefacts (Lotter *et al.* 2016; Underhill 2011). The found lithic material shows various degrees of weathering and are without substantial archaeological context or matrix, and are therefore deemed of minor scientific importance, and not conservation worthy (NCW).

These sites are given a ‘General’ Protection C (Field Rating IV C). This means these sites have been sufficiently recorded (in Phase 1). It requires no further action.

6.3.2 Graves

There are three formal cemeteries situated close to the development footprint. Two of these burial grounds, WGD002 and WGD003, is located on Erf 45 (and Erf 44), adjacent to the development footprint Site IV. The third, WGD001, is located to the south of the established township, on Plot 2954. These cemeteries are currently unfenced, and their position places them in danger from construction activities. A section of WGD003 lies on a dry riverine bank, which poses a possible threat to the graves. Floods or heavy rains may expose human remains as the ravine banks are eroded through time. An alternative lower-risk area should be considered, and any further expansion of the current cemetery should be avoided. No other graves were found within the study area.

These sites are given a ‘Local Grade IIIB’ rating. This means the graves should be included in the heritage register and may be mitigated (high/ medium significance).



Figure 10 Photographic selection of archaeological material recorded.



Figure 11 Selection of photographs of the Wegdraai town cemeteries.

6.3.3 Palaeontological resources

The Wegdraai study area is underlain by red-brown, wind-blown sand and dunes of the Kalahari Group (Gordonia Formation) as well as Tertiary sediments. Underlying these rocks are Precambrian Transvaal Supergroup deposits. According to the SAHRIS PalaeoMap, the Palaeontological Sensitivity of the Kalahari Group is moderate while that of the Tertiary is low. Palaeontological Sensitivity of the Precambrian rocks of the Transvaal Supergroup is moderate. The cherts, dolomites and iron formations of the underlying Transvaal Supergroup are too deep to affect the proposed development (Butler 2020). Elize Butler from Banzai Environmental conducted a full paleontological desktop study for this project (see Appendix 1).

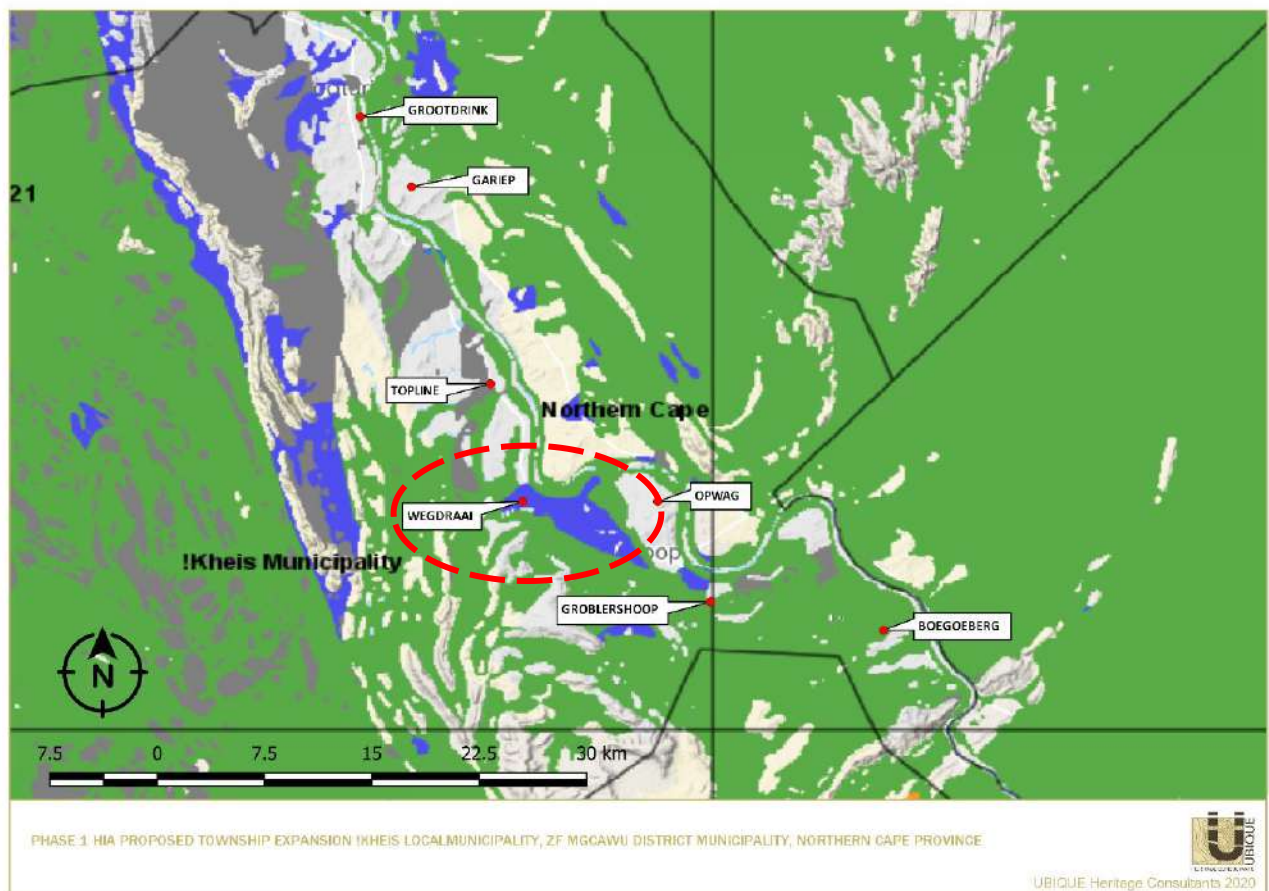


Figure 12 SAHRIS PalaeoSensitivity Map, indicating Moderate (green), Low (blue), Insignificant/Zero (grey), and Unknown (clear) palaeontological significance in the study area (<https://sahris.sahra.org.za/map/palaeo>).

7. ASSESSMENT OF THE IMPACT OF THE DEVELOPMENT

Description	Development Impact		Mitigation	Field rating/ Significance
Archaeological				
1. The six occurrences of ESA/MSA surface scatters across the development footprint.	Nature	Negative	No mitigation required.	Field Rating IV C Low significance
	Extent	Low		
	Duration	High		
	Intensity	High		
	Potential of impact on irreplaceable resource	High		
	Consequence	High		
	Probability of impact	High		
	Significance	High		
Graves				
2. The formal Wegdraai cemeteries.	Nature	Neutral	Mitigation required. Fencing and buffer zone.	Field Rating of Local Grade IIIB High significance
	Extent	Medium		
	Duration	Low		
	Intensity	Medium		
	Potential of impact on irreplaceable resource	High		
	Consequence	Medium		
	Probability of impact	Medium		
	Significance	High		
Paleontological				
3. The Palaeontological Sensitivity of the Kalahari Group is moderate while that of the Tertiary is low, and the Precambrian Transvaal Supergroup is moderate.	Nature	Neutral	No mitigation required. Chance Finds Protocol provided.	N/A
	Extent	Low		
	Duration	High		
	Intensity	Low		
	Potential of impact on irreplaceable resource	Low		
	Consequence	Low		
	Probability of impact	Low		
	Significance	Low		

The impact of the development will have a negative impact on the identified heritage resources on Erven 1 and 45, Wegdraai township, Boegoebergnedersetting RE/48. The lithic material is without any substantial archaeological context and deemed not conservation worthy. The negative impact is, therefore, negligible. The cemetery WGD001 is well outside the development footprint and should not be affected by the proposed project. Cemeteries WGD002 and especially WGD003 are located adjacent to and within the development footprint Site IV. These sites are unfenced and might be affected negatively by construction activities. Mitigation and a no-go zone are recommended. The probability of the development impacting on palaeontological heritage during the construction phase is regarded as minimal, and the significance of the impact occurring, low.

8. RECOMMENDATIONS

Based on the assessment of the potential impact of the development on the identified heritage, the following recommendations are made, taking into consideration any existing or potential sustainable social and economic benefits:

1. No significant heritage sites or features were identified within the surveyed sections of Wegdraai township, on Erven 1, 45, and 47, Boegoeberg Settlement, on the Farm Boegoebergnedersetting RE/48. The Early/Middle Stone Age cultural material identified is not conservation worthy. No further mitigation is recommended with regards to these resources. Therefore, from a heritage point of view, we recommend that the proposed development can continue.
2. The cemeteries WGD002 and WGD003 are situated close to the proposed development footprint Site IV. The sites are graded as IIIB and are of High Local Significance. It is recommended that the graves be fenced off with the inclusion of a 50m buffer/safety zone. Constant monitoring of the graves along the dry riverine should be undertaken by the municipality, to ensure timely mitigation if human remains become exposed by erosion.
3. Due to the low palaeontological significance of the area, no further palaeontological heritage studies, ground-truthing and/or specialist mitigation are required. It is considered that the development of the proposed development is deemed appropriate and feasible and will not lead to detrimental impacts on the palaeontological resources of the area (Butler 2020). If fossil remains or trace fossils are discovered during any phase of construction, either on the surface or exposed by excavations the Chance Find Protocol (Appendix A/11) must be implemented by the Environmental Control Officer (ECO) in charge of these developments. These discoveries ought to be protected, 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 mitigation can be carried out by a palaeontologist (Butler 2020).
4. Although all possible care has been taken to identify 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 assessment. If during construction, any evidence of archaeological sites or remains (e.g. remnants of stone-made structures, indigenous ceramics, bones, stone artefacts, ostrich eggshell fragments, charcoal and ash concentrations), fossils or other categories of heritage resources are found during the proposed development, SAHRA APM Unit (Natasha Higgitt/Phillip Hine 021 462 5402) must be alerted as per section 35(3) of the NHRA. If unmarked human burials are uncovered, the SAHRA Burial Grounds and Graves (BGG) Unit (Thingahangwi Tshivhase/Mimi Seetelo 012 320 8490), must be alerted immediately as per section 36(6) of the NHRA. A professional archaeologist or palaeontologist, depending on the nature of the finds, must be contacted as soon as possible to inspect the findings. If the newly discovered heritage resources prove to be of archaeological or

palaeontological significance, a Phase 2 rescue operation may be required subject to permits issued by SAHRA. UBIQUE Heritage Consultants and its personnel will not be held liable for such oversights or costs incurred as a result of such oversights.

9. CONCLUSION

This HIA has identified no significant heritage resources, apart from the at-risk cemeteries WGD002 and WGD003, that will be impacted negatively by the proposed development. The proposed expansion of the Wegdraai township, on Erven 1, 45 and 47, Boegoeberg Settlement (Kenhardt), on the Farm Boegoebergnedersetting RE/48 in the !Kheis Local Municipality, ZF Mgcawu District Municipality, Northern Cape, may continue, provided the recommendations stipulated within this report, and the subsequent decision by SAHRA, are followed.

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APPENDIX A

PALAEONTOLOGICAL DESKTOP ASSESSMENT FOR THE PROPOSED WEGDRAAI TOWNSHIP EXPANSION, !KHEIS LOCAL MUNICIPALITY, ZF MGCAWU DISTRICT MUNICIPALITY, NORTHERN CAPE PROVINCE



**PALAEONTOLOGICAL DESKTOP ASSESSMENT FOR THE PROPOSED WEGDRAAI
TOWNSHIP EXPANSION, !KHEIS LOCAL MUNICIPALITY, ZF MGCAWU DISTRICT
MUNICIPALITY, NORTHERN CAPE PROVINCE**

Reference: NC/21/2018/PP
(Wegdraai 360) / BH0070)

Issue Date: 16 June 2020
Client: UBIQUE Heritage Consultants

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 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 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 favourable 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 realise that a false declaration is an offence 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:

A handwritten signature in black ink, appearing to read 'Elize Butler', is placed over a light blue rectangular background.

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 ii 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 vitae	Section 2 – refer to Appendix A	-
(b) A declaration that the person is independent in a form as may be specified by the competent authority	Page ii 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 9	-
(d) The duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment	Desktop Study	
(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 10	
(g) An identification of any areas to be avoided, including buffers	Section 5	No buffers or areas of sensitivity identified

Requirements of Appendix 6 – GN R326 EIA Regulations of 7 April 2017	Relevant section in report	Comment where not applicable.
(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 10	
(k) Any mitigation measures for inclusion in the EMPr	Section 11	
(l) Any conditions for inclusion in the environmental authorisation		None required
(m) Any monitoring requirements for inclusion in the EMPr or environmental authorisation	Section 11	
(n)(i) A reasoned opinion as to whether the proposed activity, activities or portions thereof should be authorised and	Section 1 and 10	
(n)(iA) A reasoned opinion regarding the acceptability of the proposed activity or activities; and		
(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 10	-
(o) A description of any consultation process that was undertaken during the course of carrying out the study	N/A	Not applicable. A public consultation process will be conducted as part of the EIA and EMPr process.
(p) A summary and copies if any comments that were received during any consultation process	N/A	

Requirements of Appendix 6 – GN R326 EIA Regulations of 7 April 2017	Relevant section in report	Comment where not applicable.
(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 UBIQUE Heritage Consultants to conduct the Palaeontological Desktop Assessment (PDA) to assess the proposed Wegdraai Township Expansion on Erf 45, Erf 1, Erf 47, Wegdraai, !Kheis Local Municipality, ZF Mgcawu District Municipality, Northern Cape Province. The National Heritage Resources Act (No 25 of 1999, section 38) (NHRA), states that a Palaeontological Impact Assessment (PIA) is necessary to determine the presence of fossil material within the planned development. This PIA is thus necessary to evaluate the effect of the construction on the palaeontological resources.

The proposed development on Erf 1, Erf 45, Erf 47, Wegdraai, !Kheis Local Municipality, ZF Mgcawu District Municipality, Northern Cape Province is underlain by red-brown, wind-blown sand and dunes of the Kalahari Group (Gordonia Formation) as well as Tertiary sediments. Underlying these rocks are rocks of the Precambrian Transvaal Supergroup. According to the PalaeoMap of South African Heritage Resources Information System, the Palaeontological Sensitivity of the Kalahari Group is moderate while that of the Tertiary is low. Palaeontological Sensitivity of the Precambrian rocks of the Transvaal Supergroup is moderate. The cherts, dolomites and iron formations of the underlying Transvaal Supergroup are too deep to affect the proposed development.

If fossil remains or trace fossils 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, 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 mitigation can be carried out by a palaeontologist.

It is consequently recommended that no further palaeontological heritage studies, ground-truthing and/or specialist mitigation are required pending the discovery of newly discovered fossils.

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- Figure 2:** Topographical map indicating the locality of the Wegdraai Township Expansion on Erf 45, Erf 1, Erf 47, Wegdraai, !Kheis Local Municipality, ZF Mgcawu District Municipality, Northern Cape Province. Map modified from Ubique Consultants. 3
- Figure 3:** Extract of the 1:250 000 2820 Upington geological map (Council for Geoscience, Pretoria) indicating the position of the proposed Wegdraai Township development (indicated in green), in !Kheis Local Municipality, ZF Mgcawu District Municipality, Northern Cape Province. The development is underlain by the Kalahari Group as well as Tertiary sediments. 7

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- **INTRODUCTION**

The Barzani Group appointed Macroplan Town and Regional Planners to proceed with the completion of the Town Planning process for the Wegdraai Township Expansion (Figure 1-2). UBIQUE Heritage Consultants was appointed to conduct the Heritage Impact Assessment while Banzai Environmental was in turn appointed to conduct the Palaeontological Desktop Study.

The proposed Wegdraai Township Expansion located on Erf 45, Erf 1, Erf 47, Wegdraai, !Kheis Local Municipality, ZF Mgcawu District Municipality, Northern Cape Province comprises of the creation of new erven, as well as the formalisation of the existing informal houses that are located around the town. The Wegdraai Township expansion will accommodate 360 erven on 43 ha. This project will fill an urgent need for residential erven in the sub-economic market.

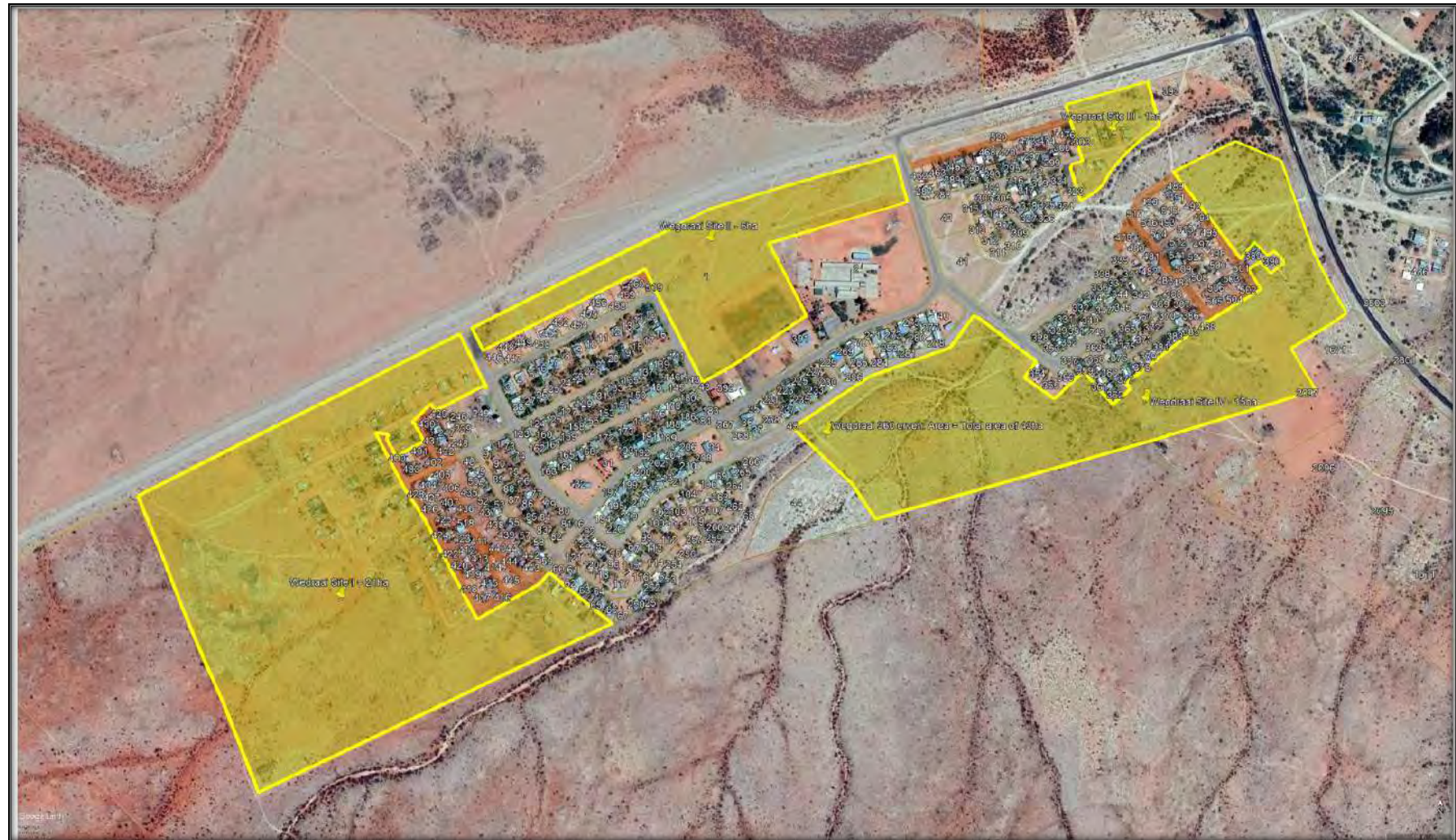


Figure 13: Google Earth Image indicating the locality of the Weddraai Township Expansion on Erf 45, Erf 1, Erf 47, Weddraai, !Kheis Local Municipality, ZF Mgcawu District Municipality, Northern Cape Province. Map modified from Ubique Consultants.

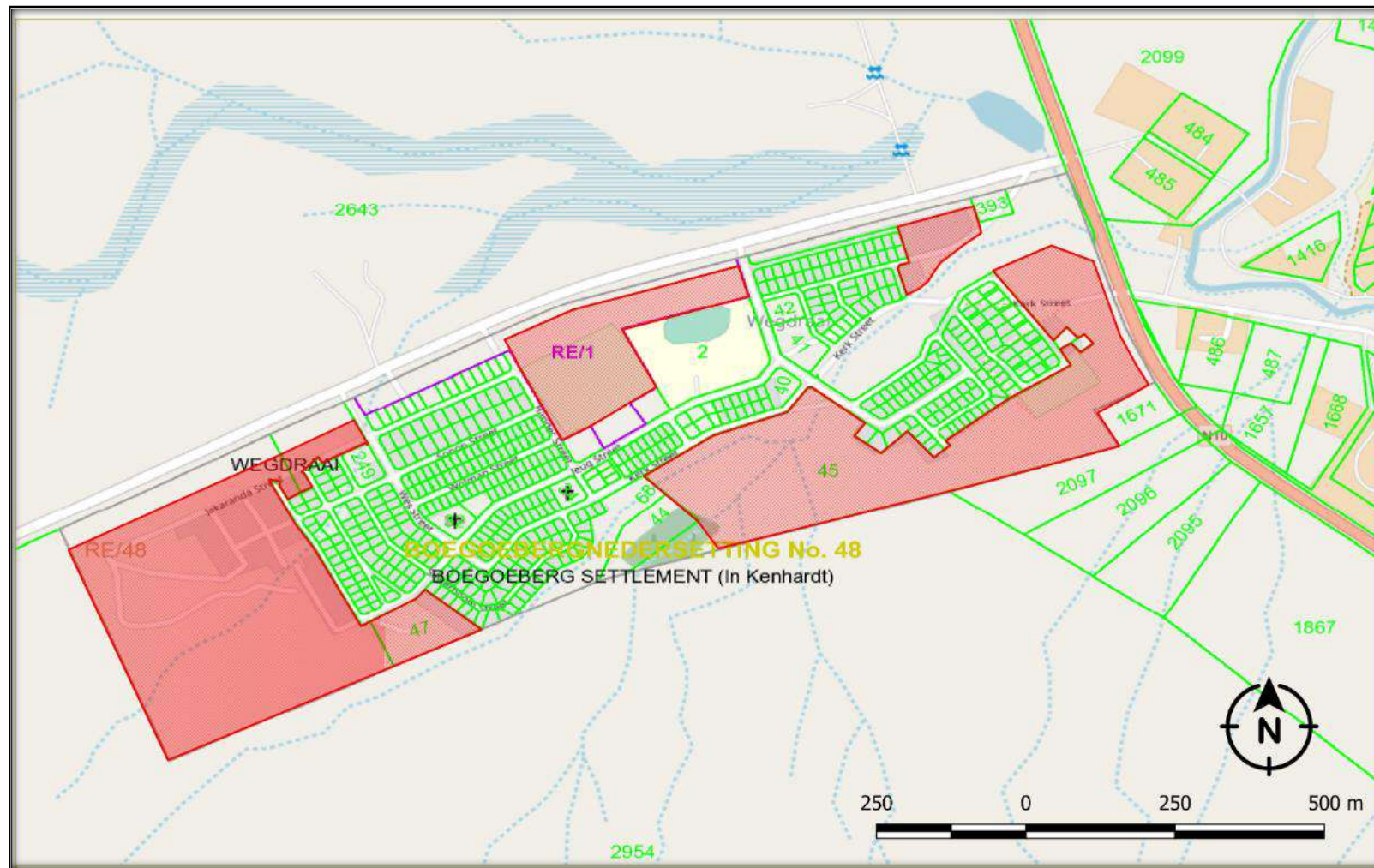


Figure 14: Topographical map indicating the locality of the Wegdraai Township Expansion on Erf 45, Erf 1, Erf 47, Wegdraai, !Kheis Local Municipality, ZF Mgcawu District Municipality, Northern Cape Province. Map modified from Ubique Consultants.

- **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 PIAs since 2014.

- **LEGISLATION**

- **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 unique and non-renewable and is protected by the NHRA. Palaeontological resources may not be unearthed, moved, broken 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 Palaeontological Desktop Assessment forms part of the Heritage Impact Assessment (HIA) and adheres 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 m² 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 m² in extent;
 - or any other category of development provided for in regulations by SAHRA or a Provincial heritage resources authority.

- **OBJECTIVE**

The objective of a Palaeontological Impact Assessment (PIA) is to determine the impact of the development on potential palaeontological material at the site.

According to the “SAHRA APM Guidelines: Minimum Standards for the Archaeological and Palaeontological Components of Impact Assessment Reports” the aims of the PIA are: 1) to **identify** the palaeontological status of the exposed as well as rock formations just below the surface in the development footprint 2) to estimate the **palaeontological importance** of the formations 3) to determine the **impact** on fossil heritage; and 4) to recommend how the developer ought to protect or mitigate 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/kmls) 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:

- 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.
- Indirect impacts** of an activity are indirect or induced changes that may occur as a result of the activity.
- Cumulative impacts** are impacts that 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).

• GEOLOGICAL AND PALAEONTOLOGICAL HISTORY

The geology of the proposed Wegdraai Township Expansion is depicted on the 2820 Upington geological map (Council for Geoscience, Pretoria). The proposed development on Erf 1, Erf 45, Erf 47, Wegdraai, !Kheis Local Municipality, ZF Mgcawu District Municipality, Northern Cape Province is underlain by red-brown, wind-blown sand and dunes of the Kalahari Group (Gordonia Formation) as well as Tertiary sediments. Underlying these rocks are rocks of the Precambrian Transvaal Supergroup. According to the PalaeoMap of South African Heritage Resources Information System, the Palaeontological Sensitivity of the Kalahari Group is moderate while that of the Tertiary is low. Palaeontological Sensitivity of the Precambrian rocks of the Transvaal Supergroup is moderate. The cherts, dolomites and iron formations of the underlying Transvaal Supergroup are too deep to affect the proposed development and will not be discussed further.

The Cenozoic Kalahari Group is the most widespread body of terrestrial sediments in southern Africa. The Cenozoic sands and calcretes of the Kalahari Group range in thickness from a few metres to more than 180m (Partridge *et al.*, 2006). The youngest formation of the Kalahari group is the Gordonia Formation which is generally termed Kalahari sand and comprises of red aeolian sands that cover most of the Kalahari Group sediments. The pan sediments of the area originated from the Gordonia Formation and contain white to brown fine-grained silts, sands, and clays. Some of the pans consist of clayey material mixed with evaporates that shows seasonal effects of shallow saline groundwaters. Quaternary alluvium, aeolian sands, surface limestone, silcrete, and terrace gravels are also included in the Kalahari Group (Kent 1980). Partridge *et al.*, (2006) describes numerous types of superficial deposits of Late Cenozoic (Miocene to Pliocene to Recent) age throughout the Karoo Basin. Radiometric dating could thus far not establish a precise boundary between the Quaternary and Tertiary (Kent, 1980). Some of these Tertiary (T) sediments are also present in the development footprint.

The fossil assemblages of the Kalahari are generally low in diversity and occur over a wide range, and thus the palaeontological diversity of this Group is low (SAHRIS website). These fossils represent terrestrial plants and animals with a close resemblance to living forms. Fossil assemblages include bivalves, diatoms, gastropod shells, ostracods, and trace fossils. The palaeontology of the Quaternary superficial deposits has been relatively neglected in the past. Late Cenozoic calcrete may comprise of bones, horn cores as well as mammalian teeth. Tortoise remains have also been uncovered as well as trace fossils which include termite and insect's burrows and mammalian trackways. Amphibian and crocodile remains have been uncovered where the depositional settings in the past were wetter.

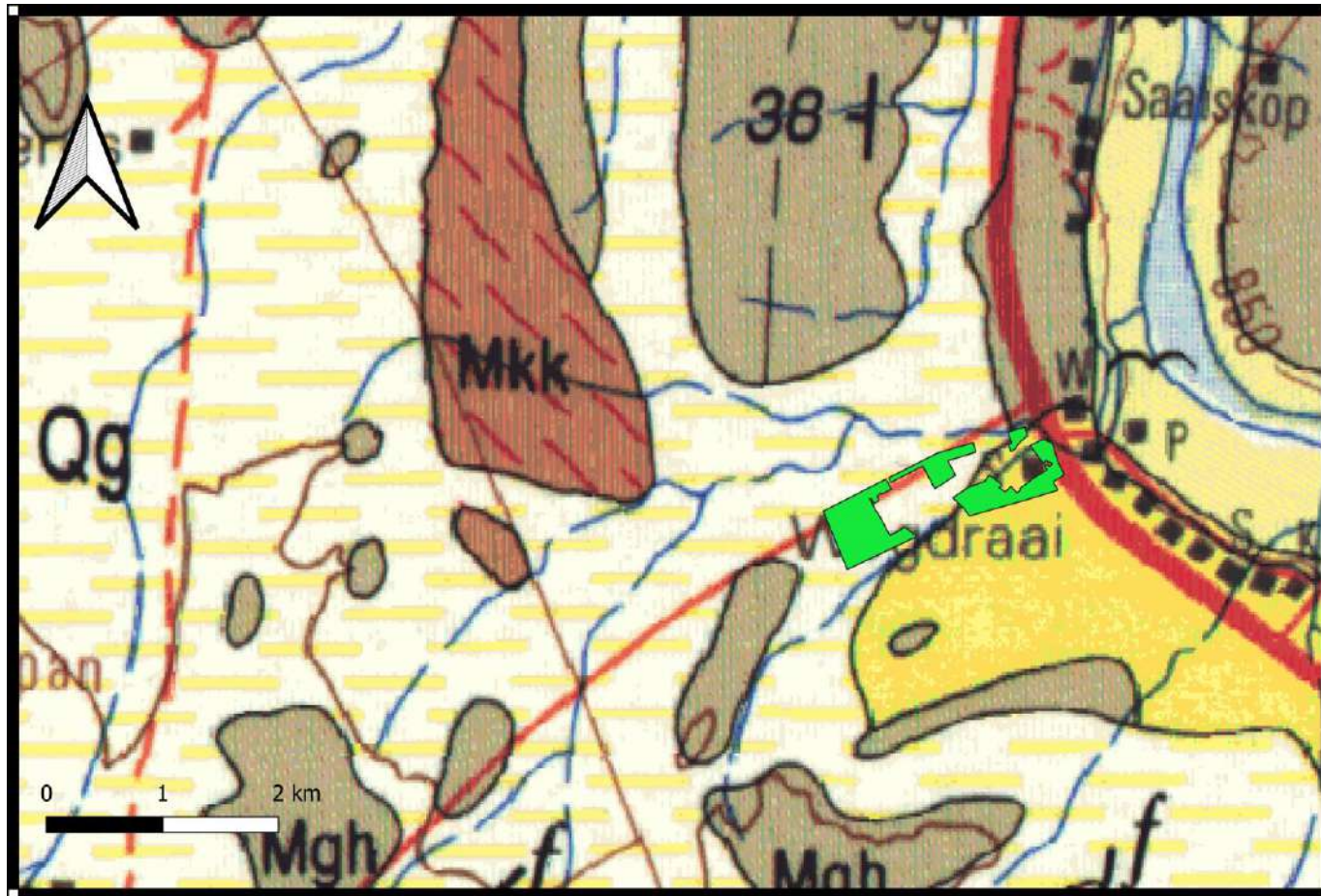


Figure 15: Extract of the 1:250 000 2820 Upington geological map (Council for Geoscience, Pretoria) indicating the position of the proposed Wegdraai Township development (indicated in green), in !Kheis Local Municipality, ZF Mgcawu District Municipality, Northern Cape Province. The development is underlain by the Kalahari Group as well as Tertiary sediments.

Legend to Map and short explanation.

Qg – Gordonia Formation, Kalahari Group, Quaternary - Red-brown, wind-blown sand and dunes.

Mgh- Groblershoop Formation, Brulpan Group, Areachap Sequence

Mkk- Kalkwerf Gneiss. Red-brown, coarse-grained granite gneiss

T- Tertiary

Table 2: Fossil Heritage of rock units represented in the development area (Almond and Pether, 2008)

GEOLOGICAL UNIT	ROCK TYPES & AGE	FOSSIL HERITAGE	PALAEONTOLOGICAL SENSITIVITY	RECOMMENDED MITIGATION
OTHER LATE CAENOZOIC TERRESTRIAL DEPOSITS OF THE INTERIOR (Most too small to be indicated on 1: 250 000 geological maps)	Fluvial, pan, lake and terrestrial sediments, including diatomite (diatom deposits), pedocretes, spring tufa / travertine, cave deposits, peats, colluvium, soils, surface gravels including downwasted rubble MOSTLY QUATERNARY TO HOLOCENE (Possible peak formation 2.6-2.5 Ma)	Bones and teeth of wide range of mammals (e.g. mastodont proboscideans, rhinos, bovids, horses, micromammals), reptiles (crocodiles, tortoises), ostrich egg shells, fish, freshwater and terrestrial molluscs (unionid bivalves, gastropods), crabs, trace fossils (e.g. termitaria, horizontal invertebrate burrows, stone artefacts), petrified wood, leaves, rhizoliths, diatom floras, peats and palynomorphs. calcareous tufas at edge of Ghaap Escarpment might be highly fossiliferous (cf Taung in NW Province – abundant Makapanian Mammal Age vertebrate remains, including australopithecines)	LOW Scattered records, many poorly studied and of uncertain age	Any substantial fossil finds to be reported by ECO to SAHRA
Gordonia Formation (Qs) KALAHARI GROUP plus SURFACE CALCRETES (TI / Qc)	Mainly aeolian sands plus minor fluvial gravels, freshwater pan deposits, calcretes PLEISTOCENE to RECENT	Calcretised rhizoliths & termitaria, ostrich egg shells, land snail shells, rare mammalian and reptile (e.g. tortoise) bones, teeth (e.g. doline infills) freshwater units associated with diatoms, molluscs, stromatolites etc.	LOW	Any substantial fossil finds to be reported by ECO to SAHRA

• GEOGRAPHICAL LOCATION OF THE SITE

The town of Wegdraai is located along the N10 road that stretches between Topline in the northern, and Groblershoop, in the south, and is bordered to the north by the Kleinbegin road. The Wegdraai Township Expansion is located about 15 km northwest (on western side of the Orange River) of Groblershoop in the !Kheis Local Municipality, ZF Mgcawu District Municipality.

Table 3: Geographical location of Wegdraai Township Expansion.

No.	Town	Total Size of the study area	Total Erven	Property Descriptions	Title Deed Numbers	Coordinates	Ownership
7	Wegdraai	43ha	360	Erf 45, Wegdraai	T36416/2002	28°50'30.57"S; 21°51'25.96"E	!Kheis Local Municipality
				Erf 1, Wegdraai	T84788/2002	28°50'13.46"S; 21°52'12.63"E	!Kheis Local Municipality
				Erf 47, Wegdraai	T36416/2002	28°50'13.70"S; 21°51'44.31"E	!Kheis Local Municipality

• METHODS

The aim of a desktop study is to evaluate the risk to palaeontological heritage in the proposed development. This includes all trace fossils and fossils. All available information is consulted to compile a desktop study and includes: Palaeontological Impact Assessment reports in the same area; aerial photos and Google Earth images, topographical as well as geological maps.

○ Assumptions and Limitations

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 never been reviewed by palaeontologists and data is generally based on aerial photographs alone. 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 sourced to provide information on the existence of fossils in an area which was not documented in the past. When using similar Assemblage Zones and geological formations for Desktop studies, it is generally **assumed** that exposed fossil heritage is present within the footprint. **A field-assessment will thus improve the accuracy of the desktop assessment.**

• 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 2820 Upington geological map (Council for Geoscience, Pretoria);
 A Google Earth map with polygons of the proposed development was obtained from Ubique Heritage Consultants.

• IMPACT ASSESSMENT METHODOLOGY

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; and
- 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 are used:

Table 4: The rating system

NATURE		
The Nature of the Impact is the possible destruction of fossil heritage		
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).
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.
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
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

○ Summary of Impact Tables

The development footprint is completely underlain by the Kalahari Group (Gordonia Formation) and Tertiary sediments. The Palaeontological Sensitivity of this Gordonia Formation is rated as Low while the sediments of the Tertiary has a palaeontological sensitivity of zero. The expected duration of the impact is assessed as potentially permanent to long term. In the absence of mitigation procedures (should fossil material be present within the affected area) the damage or destruction of any palaeontological materials will be permanent. Impacts on palaeontological heritage during the construction phase could potentially occur but are regarded as having a low probability. The significance of the impact occurring will thus be low.

• FINDINGS AND RECOMMENDATIONS

The proposed development on Erf 1, Erf 45, Erf 47, Wegdraai, !Kheis Local Municipality, ZF Mgcawu District Municipality, Northern Cape Province is underlain by red-brown, wind-blown sand and dunes of the Kalahari Group (Gordonia Formation) as well as Tertiary sediments. Underlying

these rocks are rocks of the Precambrian Transvaal Supergroup. According to the PalaeoMap of South African Heritage Resources Information System, the Palaeontological Sensitivity of the Kalahari Group is moderate while that of the Tertiary is low. Palaeontological Sensitivity of the Precambrian rocks of the Transvaal Supergroup is moderate. The cherts, dolomites and iron formations of the underlying Transvaal Supergroup are too deep to affect the proposed development and will not be discussed further.

If fossil remains or trace fossils 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, 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 mitigation can be carried out by a palaeontologist.

It is consequently recommended that no further palaeontological heritage studies, ground-truthing and/or specialist mitigation are required pending the discovery of newly discovered fossils.

- **CHANCE FINDS PROTOCOL**

A following procedure will only be followed if fossils are uncovered during excavation.

- **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.

○ **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.

○ **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 uncover 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.

○ **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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20. **Butler, E. 2016.** Recommendation from further Palaeontological Studies: Proposed Construction of the Modderfontein Filling Station on Erf 28 Portion 30, Founders Hill, City Of Johannesburg, Gauteng Province. Bloemfontein.
21. **Butler, E. 2016.** Recommendation from further Palaeontological Studies: Proposed Construction of the Modikwa Filling Station on a Portion of Portion 2 of Mooihoek 255 Kt, Greater Tubatse Local Municipality, Limpopo Province. Bloemfontein.
22. **Butler, E. 2016.** Recommendation from further Palaeontological Studies: Proposed Construction of the Heidedal filling station on Erf 16603, Heidedal Extension 24, Mangaung Local Municipality, Bloemfontein, Free State Province. Bloemfontein.
23. **Butler, E. 2016.** Recommended Exemption from further Palaeontological studies: Proposed Construction of the Gunstfontein Switching Station, 132kv Overhead Power Line (Single Or Double Circuit) and ancillary infrastructure for the Gunstfontein Wind Farm Near Sutherland, Northern Cape Province. Savannah South Africa. Bloemfontein.
24. **Butler, E. 2016.** Palaeontological Impact Assessment of the proposed Galla Hills Quarry on the remainder of the farm Roode Krantz 203, in the Lukhanji Municipality, division of Queenstown, Eastern Cape Province. Bloemfontein.
25. **Butler, E. 2016.** Chris Hani District Municipality Cluster 9 water backlog project phases 3a and 3b: Palaeontology inspection at Tsomo WTW. Bloemfontein.
26. **Butler, E. 2016.** Palaeontological Impact Assessment of the proposed construction of the 150 MW Noupoot concentrated solar power facility and associated infrastructure on portion 1 and 4 of the farm Carolus Poort 167 and the remainder of Farm 207, near Noupoot, Northern Cape. Savannah South Africa. Bloemfontein.
27. **Butler, E. 2016.** Palaeontological Impact Assessment of the proposed upgrading of the main road MR450 (R335) from the Motherwell to Addo within the Nelson Mandela Bay Municipality and Sunday's river valley Local Municipality, Eastern Cape Province. Bloemfontein.

28. **Butler, E. 2016.** Palaeontological Impact Assessment construction of the proposed Metals Industrial Cluster and associated infrastructure near Kuruman, Northern Cape Province. Savannah South Africa. Bloemfontein.
29. **Butler, E. 2016.** Palaeontological Impact Assessment for the proposed construction of up to a 132kv power line and associated infrastructure for the proposed Kalkaar Solar Thermal Power Plant near Kimberley, Free State and Northern Cape Provinces. PGS Heritage. Bloemfontein.
30. **Butler, E. 2016.** Palaeontological Impact Assessment of the proposed development of two burrow pits (DR02625 and DR02614) in the Enoch Mgijima Municipality, Chris Hani District, Eastern Cape.
31. **Butler, E. 2016.** Ezibeleni waste Buy-Back Centre (near Queenstown), Enoch Mgijima Local Municipality, Eastern Cape. Bloemfontein.
32. **Butler, E. 2016.** Palaeontological Impact Assessment for the proposed construction of two 5 Mw Solar Photovoltaic Power Plants on Farm Wildebeestkuil 59 and Farm Leeuwbosch 44, Leeudoringstad, North West Province. Bloemfontein.
33. **Butler, E. 2016.** Palaeontological Impact Assessment for the proposed development of four Leeuwberg Wind farms and basic assessments for the associated grid connection near Loeriesfontein, Northern Cape Province. Bloemfontein.
34. **Butler, E. 2016.** Palaeontological impact assessment for the proposed Aggeneys south prospecting right project, Northern Cape Province. Bloemfontein.
35. **Butler, E. 2016.** Palaeontological impact assessment of the proposed Motuoane Ladysmith Exploration right application, Kwazulu Natal. Bloemfontein.
36. **Butler, E. 2016.** Palaeontological impact assessment for the proposed construction of two 5 MW solar photovoltaic power plants on farm Wildebeestkuil 59 and farm Leeuwbosch 44, Leeudoringstad, North West Province. Bloemfontein.
37. **Butler, E. 2016:** Palaeontological desktop assessment of the establishment of the proposed residential and mixed use development on the remainder of portion 7 and portion 898 of the farm Knopjeslaagte 385 Ir, located near Centurion within the Tshwane Metropolitan Municipality of Gauteng Province. Bloemfontein.
38. **Butler, E. 2017.** Palaeontological impact assessment for the proposed development of a new cemetery, near Kathu, Gamagara local municipality and John Taolo Gaetsewe district municipality, Northern Cape. Bloemfontein.
39. **Butler, E. 2017.** Palaeontological Impact Assessment Of The Proposed Development Of The New Open Cast Mining Operations On The Remaining Portions Of 6, 7, 8 And 10 Of The Farm Kwaggafontein 8 In The Carolina Magisterial District, Mpumalanga Province. Bloemfontein.
40. **Butler, E. 2017.** Palaeontological Desktop Assessment for the Proposed Development of a Wastewater Treatment Works at Lanseria, Gauteng Province. Bloemfontein.

41. **Butler, E. 2017.** Palaeontological Scoping Report for the Proposed Construction of a Warehouse and Associated Infrastructure at Perseverance in Port Elizabeth, Eastern Cape Province.
42. **Butler, E. 2017.** Palaeontological Desktop Assessment for the Proposed Establishment of a Diesel Farm and a Haul Road for the Tshipi Borwa mine Near Hotazel, In the John Taolo Gaetsewe District Municipality in the Northern Cape Province. Bloemfontein.
43. **Butler, E. 2017.** Palaeontological Desktop Assessment for the Proposed Changes to Operations at the UMK Mine near Hotazel, In the John Taolo Gaetsewe District Municipality in the Northern Cape Province. Bloemfontein.
44. **Butler, E. 2017.** Palaeontological Impact Assessment for the Development of the Proposed Ventersburg Project-An Underground Mining Operation near Ventersburg and Henneman, Free State Province. Bloemfontein.
45. **Butler, E. 2017.** Palaeontological desktop assessment of the proposed development of a 3000 MW combined cycle gas turbine (CCGT) in Richards Bay, Kwazulu-Natal. Bloemfontein.
46. **Butler, E. 2017.** Palaeontological Impact Assessment for the Development of the Proposed Revalidation of the lapsed General Plans for Elliotdale, Mphashe Local Municipality. Bloemfontein.
47. **Butler, E. 2017.** Palaeontological assessment of the proposed development of a 3000 MW Combined Cycle Gas Turbine (CCGT) in Richards Bay, Kwazulu-Natal. Bloemfontein.
48. **Butler, E. 2017.** Palaeontological Impact Assessment of the proposed development of the new open cast mining operations on the remaining portions of 6, 7, 8 and 10 of the farm Kwaggafontein 8 10 in the Albert Luthuli Local Municipality, Gert Sibande District Municipality, Mpumalanga Province. Bloemfontein.
49. **Butler, E. 2017.** Palaeontological Impact Assessment of the proposed mining of the farm Zandvoort 10 in the Albert Luthuli Local Municipality, Gert Sibande District Municipality, Mpumalanga Province. Bloemfontein.
50. **Butler, E. 2017.** Palaeontological Desktop Assessment for the proposed Lanseria outfall sewer pipeline in Johannesburg, Gauteng Province. Bloemfontein.
51. **Butler, E. 2017.** Palaeontological Desktop Assessment of the proposed development of open pit mining at Pit 36W (New Pit) and 62E (Dishaba) Amandelbult Mine Complex, Thabazimbi, Limpopo Province. Bloemfontein.
52. **Butler, E. 2017.** Palaeontological impact assessment of the proposed development of the sport precinct and associated infrastructure at Merrifield Preparatory school and college, Amathole Municipality, East London. PGS Heritage. Bloemfontein.
53. **Butler, E. 2017.** Palaeontological impact assessment of the proposed construction of the Lehae training and fire station, Lenasia, Gauteng Province. Bloemfontein.
54. **Butler, E. 2017.** Palaeontological Desktop Assessment of the proposed development of the new open cast mining operations of the Impunzi mine in the Mpumalanga Province. Bloemfontein.

55. **Butler, E. 2017.** Palaeontological Desktop Assessment of the construction of the proposed Viljoenskroon Munic 132 KV line, Vierfontein substation and related projects. Bloemfontein.
56. **Butler, E. 2017.** Palaeontological Desktop Assessment of the proposed rehabilitation of 5 ownerless asbestos mines. Bloemfontein.
57. **Butler, E. 2017.** Palaeontological Desktop Assessment of the proposed development of the Lephalale coal and power project, Lephalale, Limpopo Province, Republic of South Africa. Bloemfontein.
58. **Butler, E. 2017.** Palaeontological Impact Assessment of the proposed construction of a 132KV powerline from the Tweespruit distribution substation (in the Mantsopa local municipality) to the Driedorp rural substation (within the Naledi local municipality), Free State province. Bloemfontein.
59. **Butler, E. 2017.** Palaeontological Desktop Assessment of the proposed development of the new coal-fired power plant and associated infrastructure near Makhado, Limpopo Province. Bloemfontein.
60. **Butler, E. 2017.** Palaeontological Impact Assessment of the proposed construction of a Photovoltaic Solar Power station near Collett substation, Middelburg, Eastern Cape. Bloemfontein.
61. **Butler, E. 2017.** Palaeontological Impact Assessment for the proposed township establishment of 2000 residential sites with supporting amenities on a portion of farm 826 in Botshabelo West, Mangaung Metro, Free State Province. Bloemfontein.
62. **Butler, E. 2017.** Palaeontological Desktop Assessment for the proposed prospecting right project without bulk sampling, in the Koa Valley, Northern Cape Province. Bloemfontein.
63. **Butler, E. 2017.** Palaeontological Desktop Assessment for the proposed Aroams prospecting right project, without bulk sampling, near Aggeneys, Northern Cape Province. Bloemfontein.
64. **Butler, E. 2017.** Palaeontological Impact Assessment of the proposed Belvior aggregate quarry II on portion 7 of the farm Maidenhead 169, Enoch Mgijima Municipality, division of Queenstown, Eastern Cape. Bloemfontein.
65. **Butler, E. 2017.** PIA site visit and report of the proposed Galla Hills Quarry on the remainder of the farm Roode Krantz 203, in the Lukhanji Municipality, division of Queenstown, Eastern Cape Province. Bloemfontein.
66. **Butler, E. 2017.** Palaeontological Impact Assessment of the proposed construction of Tina Falls Hydropower and associated power lines near Cumbu, Mthlontlo Local Municipality, Eastern Cape. Bloemfontein.
67. **Butler, E. 2017.** Palaeontological Desktop Assessment of the proposed construction of the Mangaung Gariep Water Augmentation Project. Bloemfontein.
68. **Butler, E. 2017.** Palaeontological Impact Assessment of the proposed Belvoir aggregate quarry II on portion 7 of the farm Maidenhead 169, Enoch Mgijima Municipality, division of Queenstown, Eastern Cape. Bloemfontein.

69. **Butler, E. 2017.** Palaeontological Impact Assessment of the proposed construction of the Melkspruit-Rouxville 132KV Power line. Bloemfontein.
70. **Butler, E. 2017** Palaeontological Desktop Assessment of the proposed development of a railway siding on a portion of portion 41 of the farm Rustfontein 109 is, Govan Mbeki local municipality, Gert Sibande district municipality, Mpumalanga Province. Bloemfontein.
71. **Butler, E. 2017.** Palaeontological Impact Assessment of the proposed consolidation of the proposed Ilima Colliery in the Albert Luthuli local municipality, Gert Sibande District Municipality, Mpumalanga Province. Bloemfontein.
72. **Butler, E. 2017.** Palaeontological Desktop Assessment of the proposed extension of the Kareerand Tailings Storage Facility, associated borrow pits as well as a storm water drainage channel in the Vaal River near Stilfontein, North West Province. Bloemfontein.
73. **Butler, E. 2017.** Palaeontological Desktop Assessment of the proposed construction of a filling station and associated facilities on the Erf 6279, district municipality of John Taolo Gaetsewe District, Ga-Segonyana Local Municipality Northern Cape. Bloemfontein.
74. **Butler, E. 2017.** Palaeontological Desktop Assessment of the proposed of the Lephalale Coal and Power Project, Lephalale, Limpopo Province, Republic of South Africa. Bloemfontein.
75. **Butler, E. 2017.** Palaeontological Desktop Assessment of the proposed Overvaal Trust PV Facility, Buffelspoort, North West Province. Bloemfontein.
76. **Butler, E. 2017.** Palaeontological Impact Assessment of the proposed development of the H2 Energy Power Station and associated infrastructure on Portions 21; 22 And 23 of the farm Hartebeestspuit in the Thembisile Hani Local Municipality, Nkangala District near Kwamhlanga, Mpumalanga Province. Bloemfontein.
77. **Butler, E. 2017.** Palaeontological Impact Assessment of the proposed upgrade of the Sandriver Canal and Klippan Pump station in Welkom, Free State Province. Bloemfontein.
78. **Butler, E. 2017.** Palaeontological Impact Assessment of the proposed upgrade of the 132kv and 11kv power line into a dual circuit above ground power line feeding into the Urania substation in Welkom, Free State Province. Bloemfontein.
79. **Butler, E. 2017.** Palaeontological Desktop Assessment of the proposed Swaziland-Mozambique border patrol road and Mozambique barrier structure. Bloemfontein.
80. **Butler, E. 2017.** Palaeontological Impact Assessment of the proposed diamonds alluvial & diamonds general prospecting right application near Christiana on the remaining extent of portion 1 of the farm Kaffraria 314, registration division HO, North West Province. Bloemfontein.
81. **Butler, E. 2017.** Palaeontological Desktop Assessment for the proposed development of Wastewater Treatment Works on Hartebeesfontein, near Panbult, Mpumalanga. Bloemfontein.
82. **Butler, E. 2017.** Palaeontological Desktop Assessment for the proposed development of Wastewater Treatment Works on Rustplaas near Piet Retief, Mpumalanga. Bloemfontein.

83. **Butler, E. 2018.** Palaeontological Impact Assessment for the Proposed Landfill Site in Luckhoff, Letsemeng Local Municipality, Xhariep District, Free State. Bloemfontein.
84. **Butler, E. 2018.** Palaeontological Impact Assessment of the proposed development of the new Mutsho coal-fired power plant and associated infrastructure near Makhado, Limpopo Province. Bloemfontein.
85. **Butler, E. 2018.** Palaeontological Impact Assessment of the authorisation and amendment processes for Manangu mine near Delmas, Victor Khanye local municipality, Mpumalanga. Bloemfontein.
86. **Butler, E. 2018.** Palaeontological Desktop Assessment for the proposed Mashishing township establishment in Mashishing (Lydenburg), Mpumalanga Province. Bloemfontein.
87. **Butler, E. 2018.** Palaeontological Desktop Assessment for the Proposed Mlonzi Estate Development near Lusikisiki, Ngquza Hill Local Municipality, Eastern Cape. Bloemfontein.
88. **Butler, E. 2018.** Palaeontological Phase 1 Assessment of the proposed Swaziland-Mozambique border patrol road and Mozambique barrier structure. Bloemfontein.
89. **Butler, E. 2018.** Palaeontological Desktop Assessment for the proposed electricity expansion project and Sekgame Switching Station at the Sishen Mine, Northern Cape Province. Bloemfontein.
90. **Butler, E. 2018.** Palaeontological field assessment of the proposed construction of the Zonnebloem Switching Station (132/22kV) and two loop-in loop-out power lines (132kV) in the Mpumalanga Province. Bloemfontein.
91. **Butler, E. 2018.** Palaeontological Field Assessment for the proposed re-alignment and de-commissioning of the Firham-Platrand 88kv Powerline, near Standerton, Lekwa Local Municipality, Mpumalanga province. Bloemfontein.
92. **Butler, E. 2018.** Palaeontological Desktop Assessment of the proposed Villa Rosa development In the Buffalo City Metropolitan Municipality, East London. Bloemfontein.
93. **Butler, E. 2018.** Palaeontological field Assessment of the proposed Villa Rosa development In the Buffalo City Metropolitan Municipality, East London. Bloemfontein.
94. **Butler, E. 2018.** Palaeontological desktop assessment of the proposed Mookodi – Mahikeng 400kV line, North West Province. Bloemfontein.
95. **Butler, E. 2018.** Palaeontological Desktop Assessment for the proposed Thornhill Housing Project, Ndlambe Municipality, Port Alfred, Eastern Cape Province. Bloemfontein.
96. **Butler, E. 2018.** Palaeontological desktop assessment of the proposed housing development on portion 237 of farm Hartebeestpoort 328. Bloemfontein.
97. **Butler, E. 2018.** Palaeontological desktop assessment of the proposed New Age Chicken layer facility located on holding 75 Endicott near Springs in Gauteng. Bloemfontein.
98. **Butler, E. 2018** Palaeontological Desktop Assessment for the development of the proposed Leslie 1 Mining Project near Leandra, Mpumalanga Province. Bloemfontein.
99. **Butler, E. 2018.** Palaeontological field assessment of the proposed development of the Wildealskloof mixed use development near Bloemfontein, Free State Province. Bloemfontein.

100. **Butler, E. 2018.** Palaeontological Field Assessment of the proposed Megamor Extension, East London. Bloemfontein
101. **Butler, E. 2018.** Palaeontological Impact Assessment of the proposed diamonds Alluvial & Diamonds General Prospecting Right Application near Christiana on the Remaining Extent of Portion 1 of the Farm Kaffraria 314, Registration Division HO, North West Province. Bloemfontein.
102. **Butler, E. 2018.** Palaeontological Impact Assessment of the proposed construction of a new 11kV (1.3km) Power Line to supply electricity to a cell tower on farm 215 near Delportshoop in the Northern Cape. Bloemfontein.
103. **Butler, E. 2018.** Palaeontological Field Assessment of the proposed construction of a new 22 kV single wood pole structure power line to the proposed MTN tower, near Britstown, Northern Cape Province. Bloemfontein.
104. **Butler, E. 2018.** Palaeontological Exemption Letter for the proposed reclamation and reprocessing of the City Deep Dumps in Johannesburg, Gauteng Province. Bloemfontein.
105. **Butler, E. 2018.** Palaeontological Exemption letter for the proposed reclamation and reprocessing of the City Deep Dumps and Rooikraal Tailings Facility in Johannesburg, Gauteng Province. Bloemfontein.
106. **Butler, E. 2018.** Proposed Kalabasfontein Mine Extension project, near Bethal, Govan Mbeki District Municipality, Mpumalanga. Bloemfontein.
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109. **Butler, E. 2018.** Environmental Impact Assessment (EIA) for the Proposed 325mw Rondekop Wind Energy Facility between Matjiesfontein And Sutherland In The Northern Cape Province.
110. **Butler, E. 2018.** Palaeontological Impact Assessment of the proposed construction of the Tooverberg Wind Energy Facility, and associated grid connection near Touws River in the Western Cape Province. Bloemfontein.
111. **Butler, E. 2018.** Palaeontological impact assessment of the proposed Kalabasfontein Mining Right Application, near Bethal, Mpumalanga.
112. **E. Butler. 2019.** Palaeontological Desktop Assessment of the proposed Westrand Strengthening Project Phase II.
113. **E. Butler. 2019.** Palaeontological Field Assessment for the proposed Sirius 3 Photovoltaic Solar Energy Facility near Upington, Northern Cape Province
114. **E. Butler. 2019.** Palaeontological Field Assessment for the proposed Sirius 4 Photovoltaic Solar Energy Facility near Upington, Northern Cape Province
115. **E. Butler. 2019.** Palaeontological Field Assesment for Heuningspruit PV 1 Solar Energy Facility near Koppies, Ngwathe Local Municipality, Free State Province.

116. **E. Butler.** 2019. Palaeontological Field Assessment for the Moeding Solar Grid Connection, North West Province.
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118. **E. Butler.** 2019. Recommended Exemption from further Palaeontological studies: of Proposed Agricultural Development, Plot 1178, Kakamas South Settlement, Kai! Garib Municipality
119. **E. Butler.** 2019. Palaeontological Desktop Assessment for the Proposed Waste Rock Dump Project at Tshipi Borwa Mine, near Hotazel, Northern Cape Province:
120. **E. Butler.** 2019. Palaeontological Exemption Letter for the proposed DMS Upgrade Project at the Sishen Mine, Gamagara Local Municipality, Northern Cape Province
121. **E. Butler.** 2019. Palaeontological Desktop Assessment of the proposed Integrated Environmental Authorisation process for the proposed Der Brochen Amendment project, near Groblershoop, Limpopo
122. **E. Butler.** 2019. Palaeontological Desktop Assessment of the proposed updated Environmental Management Programme (EMPr) for the Assmang (Pty) Ltd Black Rock Mining Operations, Hotazel, Northern Cape
123. **E. Butler.** 2019. Palaeontological Desktop Assessment of the proposed Kriel Power Station Lime Plant Upgrade, Mpumalanga Province
124. **E. Butler.** 2019. Palaeontological Impact Assessment for the proposed Kangala Extension Project Near Delmas, Mpumalanga Province.
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130. **E. Butler. 2019.** Palaeontological Desktop Assessment of the proposed Vedanta Housing Development, Pella Mission 39, Khâi-Ma Local Municipality, Namakwa District Municipality, Northern Cape.
131. **E. Butler. 2019.** Palaeontological Desktop Assessment for The Proposed 920 Kwp Groenheuwel Solar Plant Near Augrabies, Northern Cape Province
132. **E. Butler. 2019.** Palaeontological Desktop Assessment for the establishment of a Super Fines Storage Facility at Amandelbult Mine, Near Thabazimbi, Limpopo Province
133. **E. Butler. 2019.** Palaeontological Impact Assessment for the proposed Sace Lifex Project, Near Emalahleni, Mpumalanga Province
134. **E. Butler. 2019.** Palaeontological Desktop Assessment for the proposed Rehau Fort Jackson Warehouse Extension, East London
135. **E. Butler. 2019.** Palaeontological Desktop Assessment for the proposed Environmental Authorisation Amendment for moving 3 Km Of the Merensky-Kameni 132KV Powerline
136. **E. Butler. 2019.** Palaeontological Impact Assessment for the proposed Umsobomvu Solar PV Energy Facilities, Northern and Eastern Cape
137. **E. Butler. 2019.** Palaeontological Desktop Assessment for six proposed Black Mountain Mining Prospecting Right Applications, without Bulk Sampling, in the Northern Cape.
138. **E. Butler. 2019.** Palaeontological field Assessment of the Filling Station (Rietvlei Extension 6) on the Remaining Portion of Portion 1 of the Farm Witkoppies 393JR east of the Rietvleidam Nature Reserve, City of Tshwane, Gauteng
139. **E. Butler. 2019.** Palaeontological Desktop Assessment Of The Proposed Upgrade Of The Vaal Gamagara Regional Water Supply Scheme: Phase 2 And Groundwater Abstraction
140. **E. Butler. 2019.** Palaeontological Desktop Assessment Of The Expansion Of The Jan Kempdorp Cemetery On Portion 43 Of Farm Guldenskat 36-Hn, Northern Cape Province
141. **E. Butler. 2019.** Palaeontological Desktop Assessment of the Proposed Residential Development On Portion 42 Of Farm Geldunskat No 36 In Jan Kempdorp, Phokwane Local Municipality, Northern Cape Province
142. **E. Butler. 2019.** Palaeontological Impact Assessment of the proposed new Township Development, Lethabo Park, on Remainder of Farm Roodepan No 70, Erf 17725 And Erf 15089, Roodepan Kimberley, Sol Plaatjies Local Municipality, Frances Baard District Municipality, Northern Cape
143. **E. Butler. 2019.** Palaeontological Protocol for Finds for the proposed 16m WH Battery Storage System in Steinkopf, Northern Cape Province
144. **E. Butler. 2019.** Palaeontological Exemption Letter of the proposed 4.5WH Battery Storage System near Midway-Pofadder, Northern Cape Province
145. **E. Butler. 2019.** Palaeontological Exemption Letter of the proposed 2.5ml Process Water Reservoir at Gloria Mine, Black Rock, Hotazel, Northern Cape
146. **E. Butler. 2019.** Palaeontological Desktop Assessment for the Establishment of a Super Fines Storage Facility at Gloria Mine, Black Rock Mine Operations, Hotazel, Northern Cape:

147. **E. Butler.** 2019. Palaeontological Desktop Assessment for the Proposed New Railway Bridge, and Rail Line Between Hotazel And The Gloria Mine, Northern Cape Province
148. **E. Butler.** 2019. Palaeontological Exemption Letter Of The Proposed Mixed Use Commercial Development On Portion 17 Of Farm Boegoeberg Settlement Number 48, !Kheis Local Municipality In The Northern Cape Province
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150. **E. Butler.** 2019. Palaeontological Desktop Assessment of the Proposed Diamonds (Alluvial, General & In Kimberlite) Prospecting Right Application near Postmasburg, Registration Division; Hay, Northern Cape Province
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153. **E. Butler.** 2019. Palaeontological Desktop Assessment of the proposed seepage interception drains at Duvha Power Station, Emalahleni Municipality, Mpumalanga Province
154. **E. Butler.** 2019. Palaeontological Desktop Assessment letter for the Proposed PV Solar Facility at the Heineken Sedibeng Brewery, near Vereeniging, Gauteng.
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156. **E. Butler.** 2019. Palaeontological field Assessment for the Proposed Upgrade of the Kolomela Mining Operations, Tsantsabane Local Municipality, Siyanda District Municipality, Northern Cape Province, Northern Cape
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158. **E. Butler.** 2019. Palaeontological Phase 1 Field Assessment of the proposed Summerpride Residential Development and Associated Infrastructure on Erf 107, Buffalo City Municipality, East London.
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161. **E. Butler.** 2019. Palaeontological Desktop Assessment for the Proposed Environmental Authorisation and Amendment Processes for Elandsfontein Colliery.

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165. **E. Butler.** 2019. Palaeontological Field Assessment for the Proposed Nigel Gas Transmission Pipeline Project in the Nigel Area of the Ekurhuleni Metropolitan Municipality, Gauteng Province
166. **E. Butler.** 2019. Palaeontological Desktop Assessment for five Proposed Black Mountain Mining Prospecting Right Applications, Without Bulk Sampling, in the Northern Cape.
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170. **E. Butler.** 2019. Palaeontological Desktop Assessment for the Proposed Kangra Maquasa Block C Mining development near Piet Retief, in the Mkhondo Local Municipality within the Gert Sibande District Municipality
171. **E. Butler.** 2019. Palaeontological Desktop Assessment for the Proposed Amendment of the Kusipongo Underground and Opencast Coal Mine in Support of an Environmental Authorization and Waste Management License Application.
172. **E. Butler.** 2019. Palaeontological Exemption Letter of the Proposed Mamatwan Mine Section 24g Rectification Application, near Hotazel, Northern Cape Province
173. Palaeontological Field Assessment for the Proposed Environmental Authorisation and Amendment Processes for Elandsfontein Colliery
174. Palaeontological Desktop Assessment for the Proposed Extension of the South African Nuclear Energy Corporation (Necsa) Pipe Storage Facility, Madibeng Local Municipality, North West Province
175. Palaeontological Field Assessment for the Proposed Piggery on Portion 46 of the Farm Brakkefontien 416, Within the Nelson Mandela Bay Municipality, Eastern Cape
176. Palaeontological field Assessment for the proposed Rietfontein Housing Project as part of the Rapid Land Release Programme, Gauteng Province Department of Human Settlements, City of Johannesburg Metropolitan Municipality

177. Palaeontological Desktop Assessment for the Proposed Choje Wind Farm between Grahamstown and Somerset East, Eastern Cape
178. Palaeontological Desktop Assessment of the Proposed Prospecting Right Application for the Prospecting of Diamonds (Alluvial, General & In Kimberlite), Combined with A Waste License Application, Registration Division: Gordonia And Kenhardt, Northern Cape Province
179. Palaeontological Impact Assessment for the Proposed Clayville Truck Yard, Ablution Blocks and Wash Bay to be Situated on Portion 55 And 56 Of Erf 1015, Clayville X11, Ekurhuleni Metropolitan Municipality, Gauteng Province
180. Palaeontological Desktop Assessment for the Proposed Hartebeesthoek Residential Development
181. Palaeontological Desktop Assessment for the Proposed Mooiplaats Educational Facility, Gauteng Province
182. Palaeontological Impact Assessment for the Proposed Monument Park Student Housing Establishment
183. Palaeontological Field Assessment for the Proposed Standerton X10 Residential and Mixed-Use Developments, Lekwa Local Municipality Standerton, Mpumalanga Province
184. Palaeontological Field Assessment for the Rezoning and Subdivision of Portion 6 Of Farm 743, East London
185. Palaeontological Field Assessment for the Proposed Matla Power Station Reverse Osmosis Plant, Mpumalanga Province

CONFERENCE CONTRIBUTIONS

NATIONAL

PRESENTATION

Butler, E., Botha-Brink, J., and F. Abdala. A new gorgonopsian from the uppermost *Dicynodon Assemblage Zone*, Karoo Basin of South Africa. 18th the Biennial conference of the PSSA 2014. Wits, Johannesburg, South Africa.

INTERNATIONAL

Attended the Society of Vertebrate Palaeontology 73th Conference in Los Angeles, America. October 2012.

CONFERENCES: POSTER PRESENTATION

NATIONAL

Butler, E., and J. Botha-Brink. Cranial skeleton of *Galesaurus planiceps*, implications for biology and lifestyle. University of the Free State Seminar Day, Bloemfontein. South Africa. November 2007.

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Butler, E., and J. Botha-Brink. The biology of the South African non-mammaliaform cynodont *Galesaurus planiceps*. 15th Conference of the PSSA, Howick, South Africa. August 2008.

INTERNATIONAL VISITS

Natural History Museum, London

July 2008

Paleontological Institute, Russian Academy of Science, Moscow

November 2014



ANNEXURE I: FRESH WATER REPORT





**WATER USE LICENSE APPLICATION
FOR THE PROPOSED URBAN DEVELOPMENT AT WEGDRAAI, NORTHERN
CAPE**

FRESH WATER REPORT

A REQUIREMENT IN TERMS OF SECTION 21 OF THE NATIONAL WATER ACT
MAY 2020



**watsan
AFRICA**

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Abbreviations

Northern Cape Department: Co-Operative Governance, Human Settlements and Traditional Affairs	COGHSTA
Critical Biodiversity Area	CBA
Department of Water and Sanitation	DWA
Ecological Importance	EI
Ecological Sensitivity	ES
Ecological Support Area	ESA
Environmental Impact Assessment	EIA
Electronic Water Use License Application (on-line)	eWULAA
Government Notice	GN
Hectares	ha
Legal water use	LWU
Metres Above Sea Level	masl
National Environmental Management Act (107 of 1998)	NEMA
National Freshwater Environment Priority Area	NFEPA
National Water Act (36 of 1998)	NWA
Non-government organization	NGO
Present Ecological State	PES
South Africa National Biodiversity Institute	SANBI
Section of an Act of Parliament	S
Water Use License Application	WULA

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NEMA PUBLIC PARTICIPATION PROCESS**PROPOSED TOWNSHIP DEVELOPMENT ON ERF 1, ERF 45 AND ERF 47, WEGDRAAI****!KHEIS LOCAL MUNICIPALITY**

Notice is hereby given of the intention to submit a NEMA application and a Water Use License Application (WULA), and the availability of the Draft Scoping Report for viewing and comment as part of the public participation process, in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended ("NEMA"), Environmental Impact Assessment Regulations 2014 and the National Water Act, 1998 (Act No. 36 of 1998). The proposed township development on Erven 1, 45 and 47, Wegdraai includes activities listed in terms of the NEMA EIA Regulations 2014.

EnviroAfrica cc has been appointed by the !Kheis Local Municipality to undertake the NEMA Application for Environmental Authorisation process.

Application for environmental authorization to undertake the following activities in terms of NEMA EIA Regulations 2014:

- Government Notice R327 (Listing Notice 1): Activity No. **12, 19, 24, 27, 56**
- Government Notice R325 (Listing Notice 2): Activity No. **15**
- Government Notice R324 (Listing Notice 3): Activity No. **4, 12, 14**

**Please note that the listed activities above may change during the course of the NEMA Application process. Registered I&APs will be notified of any changes.*

Project Description & Location:

The !Kheis Local Municipality is proposing that a new township development, consisting of approximately 360 erven and associated infrastructure on Erf 1, Erf 45 and Erf 47, Wegdraai, located approximately 13km north-west of Groblershoop along the N10 in the !Kheis Local Municipality, Northern Cape.

The proposed project entails the development of approximately 360 low income erven, including associated infrastructure such as roads, water, stormwater, effluent and electricity reticulation. The total area to be developed measures approximately 43 hectares.

Site co-ordinates: 28° 50' 22.86" S, 21° 51' 52.89" E.

Public Participation:

Interested and Affected Parties (I&APs) are hereby notified of the application and invited to register (in writing) and/or provide comments and identify any issues, concerns or opportunities relating to this project to the contact details provided below, **on or before 03 July 2020**. In order to register or submit comment, I&APs should refer to the project name, and provide their name, address & contact details (*indicating your preferred method of notification*) and an indication of any direct business, financial, personal, or other interest which they have in the application. Please note that future correspondence will only be sent to registered Interested and Affected Parties.

Please note that only Registered I&APs will be notified of the availability of reports and other written submissions made (or to be made) to the Department by the applicant, and be entitled to comment on these reports and submissions; will be notified of the outcome of the application, the reasons for the decision, and that an appeal may be lodged against a decision; and will be notified of the applicant's intention to appeal the decision of the competent authority, together with an indication of where and for what period the appeal submission will be available for inspection.

You are also requested to pass this information to any person you feel should be notified. The Draft Scoping Report will be available for viewing at the Kheis Municipal offices (97 Oranje Str, Groblershoop) and at the following website: <https://enviroafrica.co.za/projects/for-public-participation/>

Consultant: EnviroAfrica CC. P.O. Box 5367, Helderberg, 7135 / Fax: 086 512 0154 / Tel: 021 8511616 / E-mail: clinton@enviroafrica.co.za



Figure 1 Public participation

1 Introduction

On 14 May 2020, an email message was received from Mr Len Fourie, director at Macroplan of Upington:

“The appointment of Gobetla Beplannings Dienste TA Macroplan by the Barzani Group (on behalf of COGHSTA) received on the 17th of April 2020 and the attached documentation have reference.

“We hereby confirm that Macroplan has been appointed as Town and Regional Planners to handle the formal Town Planning Process in accordance with the SPLUMA legislation (Act 16 of 2013). The mentioned process is for the provision of much needed residential erven in the sub-economic market that is of National and Provincial interest for towns in the !Kheis Local Municipality, ZF Mgcawu District Municipality, Northern Cape Province.

“Macroplan and all sub-consultants were requested to proceed with site verification, site visits, contour mapping, specialists environmental studies, geotechnical studies, as well as civil and engineering investigations for the mentioned project asap due to the importance of continued service delivery in the !Kheis Local Municipal area. Your firm as a sub-consultant of Macroplan is hereby requested to proceed with organising the site visits to the following areas that is located within the !Kheis Local Municipality.”

This adequately explains the situation.

Enviro Africa of Somerset West was subsequently appointed to carry out the EIA, in terms of NEMA, together with the public participation process (Figure 1).

Likewise, WATSAN Africa was appointed to produce the Fresh Water Report and carry out the WULA in terms of the NWA. The required site visits were conducted on 20 and 21 May 2020.

The Fresh Water Report must contain adequate information to allow for informed decision-making. The decision to approve the proposed urban development rests with DWS officials, in terms of S21 of the NWA. The Fresh Water Report must contain specified information according to a set profile, which has been developed over a number of years over many such reports and in accordance with GN509. A Risk Matrix is to be completed, as published on the DWA webpage.

This then is the fourth of 7 reports. For each of these reports, the issues are very much the same, with a similar terrain and social-economic circumstances. Consequently, the reports are the same, being mirror images of one another, but adapted to the specific localities and specific issues for each of the townships.

2 Seven Townships

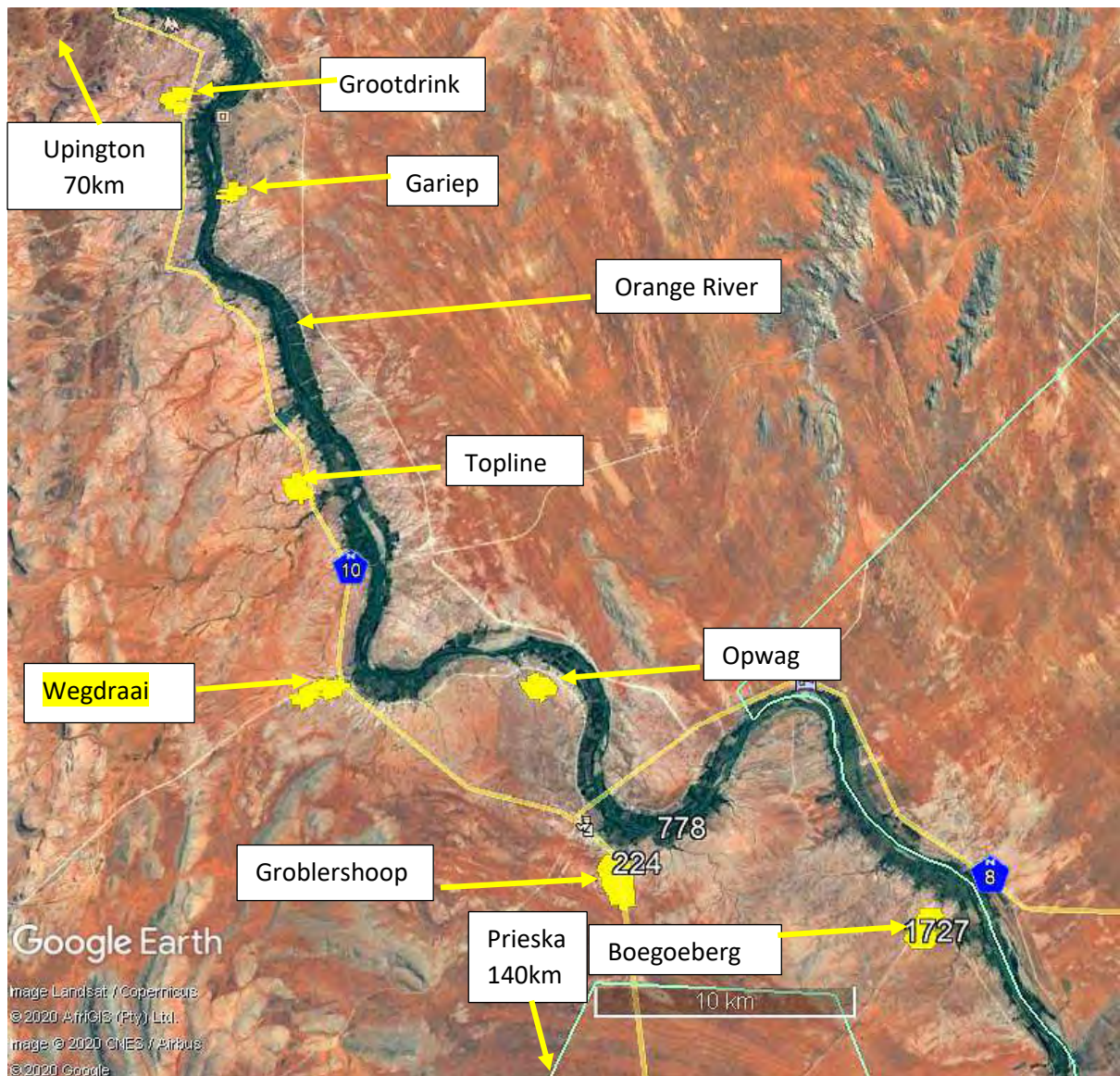


Figure 2 Seven townships

The seven townships that are being considered for extension are depicted in Figure 2. Wegdraai is highlighted in yellow and is the subject of this Fresh Water Report.

3 Legal Framework

The proposed development “triggers” sections of the National Water Act. These are the following:

S21 (c) Impeding or diverting the flow of a water course

The proposed development is spanning the banks of a drainage line. A drainage line would be altered, should the development go ahead.

S21 (i) Altering the bed, bank, course of characteristics of a water course.

Some part of the proposed development will alter the characteristics of the banks of a drainage line.

Government Notice 267 of 24 March 2017

Government Notice 1180 of 2002.

Risk Matrix.

The Risk Matrix as published on the DWS official webpage must be completed and submitted along with the Water Use Licence Application (WULA). The outcome of this risk assessment determines if a letter of consent, a General Authorization or a License is required.

Government Notice 509 of 26 August 2016

An extensive set of regulations that apply to any development in a water course is listed in this government notice in terms of Section 24 of the NWA. No development take place within the 1:100 year-flood line without the consent of the DWS. If the 1:100-year flood line flood line is not known, no development may take place within a 100m from a water course without the consent of the DWS. The development is adjacent to drainage lines, which are defined as legitimate water resources.

Likewise, the development triggers a part of the National Environmental Management Act, NEMA, 107 of 1998).

The EIA Regulations of 2014 No.1 Activity 12 states that no development may take place within 32m of a water course without the consent of the Department of Environmental Affairs and its provincial representatives. A part of the development is adjacent to drainage lines. Consequently, this regulation is relevant to this application.

This Fresh Water Report is exclusively focussed in S21 (c) and (i) of the NWA

4 !Kheis Municipality Overview



Figure 3 !Kheis Municipality

According to available information

(municipalities.co.za/1181/kheis-local-municipality)

Area	11 107km ²
Population	16 566 (2016)
Households	4344

The municipal offices are located in Groblershoop.

Only 59% of the houses were listed as formal dwellings, 41% were connected to the urban sewerage system, 62% had formal refuse removal, 21% had piped water and 74% had electricity. As from the year 2020, 500 more households were provided with solar panels and batteries to provide electricity.

The average fertility rate over the past 5 years was 2.67%

(<https://irr.org.za/reports/freefacts/files/00-2014-freefacts-2014-february-2020-draft.pdf>)

This means, according to available demographic data, that currently at least 116 new houses are required every year.

To address any backlog and to make provision for future housing requirements, new plots are demarcated in the following locations:

Groblershoop	1500
Boegoeberg	550
Opwag	730
Wegdraai	360
Topline	248
Grootdrink	370
Gariep	135

Urban development is specifically required along the Orange River, where large-scale and labour-intensive farming of vineyards under irrigation sparks human settlements.

The municipality appointed the town and regional planning company Macroplan of Upinton to lay out the new plots in these 7 townships.

5 Climate Groblershoop

http://www.saexplorer.co.za/south-africa/climate/groblershoop_climate.asp

Groblershoop normally receives about 108mm of rain per year, with most rainfall occurring mainly during autumn. The chart below (Figure 4, lower left) shows the average rainfall values for Groblershoop per month. It receives the lowest rainfall (0mm) in June and the highest (32mm) in March. The monthly distribution of average daily maximum temperatures (centre chart below) shows that the average midday temperatures for Groblershoop range from 19°C in June to 33°C in January. The region is the coldest during July when the mercury drops to 2°C on average during the night. Consult the chart below (lower right) for an indication of the monthly variation of average minimum daily temperatures.

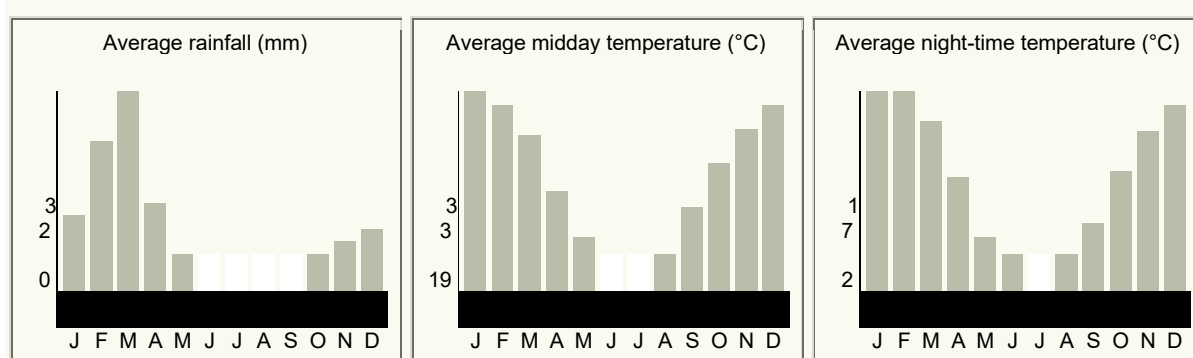


Figure 4 Climate Groblershoop

Groblershoop and surrounds is located in the Nama Karoo, which is from all points of view an arid area. For 4 months of the year there is no rainfall at all.

According to

<https://weatherspark.com/y/86570/Average-Weather-in-Groblershoop-South-Africa-Year-Round>

the dry season at Groblershoop lasts up to 6.4 months from April to November.

The evaporation rate in the nearby Upington, 70km to the north, is more than 2500mm per year. This is 27 times more than the annual precipitation.

http://www.dwaf.gov.za/orange/Low_Orange/upington.aspx

The local economy (agriculture) is entirely dependent on irrigation out of the Orange River.

6 Vegetation

The South African National Biodiversity Institute (SANBI) indicated the vegetation type on the property as Bushmanland Arid Grassland. The vegetation around the river is indicated as Lower Gariep Alluvial Vegetation. The Orange River is a National Freshwater Ecosystem Priority Area (NFEPA). The riparian area is indicated as Nama Karoo Bushmanland_Floodplain Wetland, despite that most of it today is manicured agriculture.

7 Quaternary Catchment

Wegdraai is in the D73D quaternary catchment.

8 Drainage Lines

The landscape around much of the Lower Orange River and the Sak River is dominated by a dense succession of drainage lines, each with their own sub-catchment. The drainage lines spread along the river with many smaller tributaries to cover the entire area. The iron oxides in the sands renders a red hue that is visible from space on the Google Earth images. These reds are concentrated in the drainage lines, making them even more visible (Figure 5).

The drainage lines are mostly dry, with water only during rains and perhaps shortly thereafter. During the odd thunder storm, drainage lines can come down in flood. These floods maintain the drainage line's morphological integrity, as sediments are moved and these water ways are scoured out.

Because rainfall events are far apart, the drainage lines must have been formed over millennia, even since geological times.

The vegetation in these arid parts is sparse, with a low diversity of plant species and a limited habitat variability. Drainage lines are often overgrown with a mature stand of sweet thorn *Vachellia karoo*, together with some other scrub and low trees such as *Searsia* species. In other parts the dominant tree is swarthaak *Senegalia mellifera*. This considerably adds to the habitat variability of the region. These tree lines stretch over the otherwise barren landscape and provide a linear connected habitat that would have been entirely absent if it was not for the shallow ground water in the unconfined aquifer in the drainage line's alluvium. Likewise, these tree lines provide habitat and nourishment to a variety of fauna that would have been entirely absent, was it not for the gradual migration of shallow ground water along the drainage lines.

All over the arid and semi-arid landscape of the western half of South Africa, these tree lines are considered to have a special and high conservation value.

Around the Orange River and even the Sak and Hartbees River, large-scale agriculture has changed the drainage lines into drainage channels among the vineyards and orchards. The upper reaches away from the rivers are less impacted,

even near-pristine, as intense agriculture is not possible, apart from those areas where water is piped over long distances from the Orange River.

The conservation of drainage lines along the Lower Orange River deserves and demands attention by decision-making authorities, environmental practitioners, the conservation and farming community alike. As more of these drainage lines are impacted upon, and because impacts are radical by nature, because sections of drainage lines are replaced by vineyards or other forms of agriculture, or transformed into return flow infrastructure, the necessity for a widely accepted conservation policy becomes urgent as development escalates.



Figure 5 Drainage Lines

9 The Wegdraai Housing Project

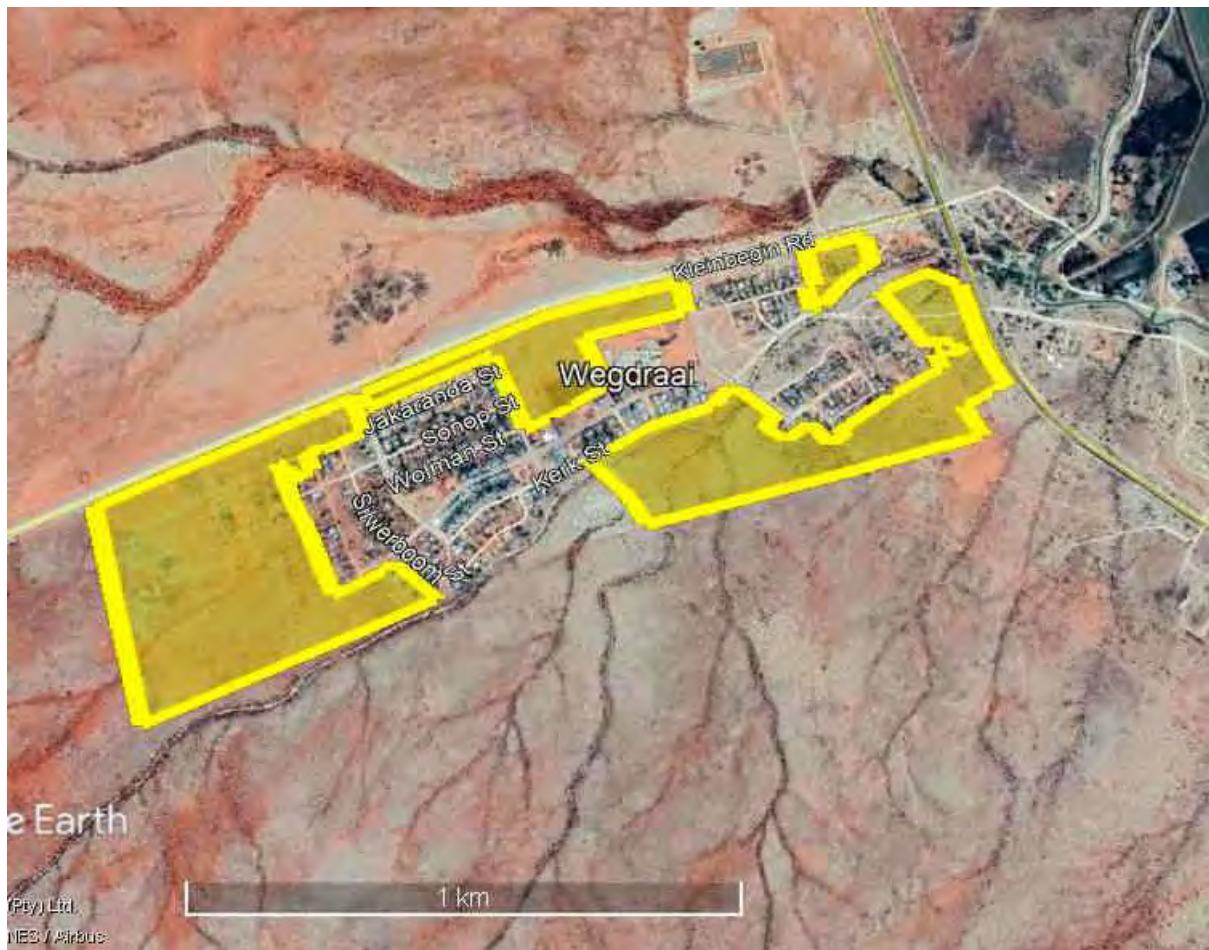


Figure 6 Wegdraai Housing (Macroplan)

The area on which the housing is going to be built is depicted in Figure 6. There are four patches of land earmarked for development, which together will more than double the current township.

10 The Wegdraai Housing Drainage Line

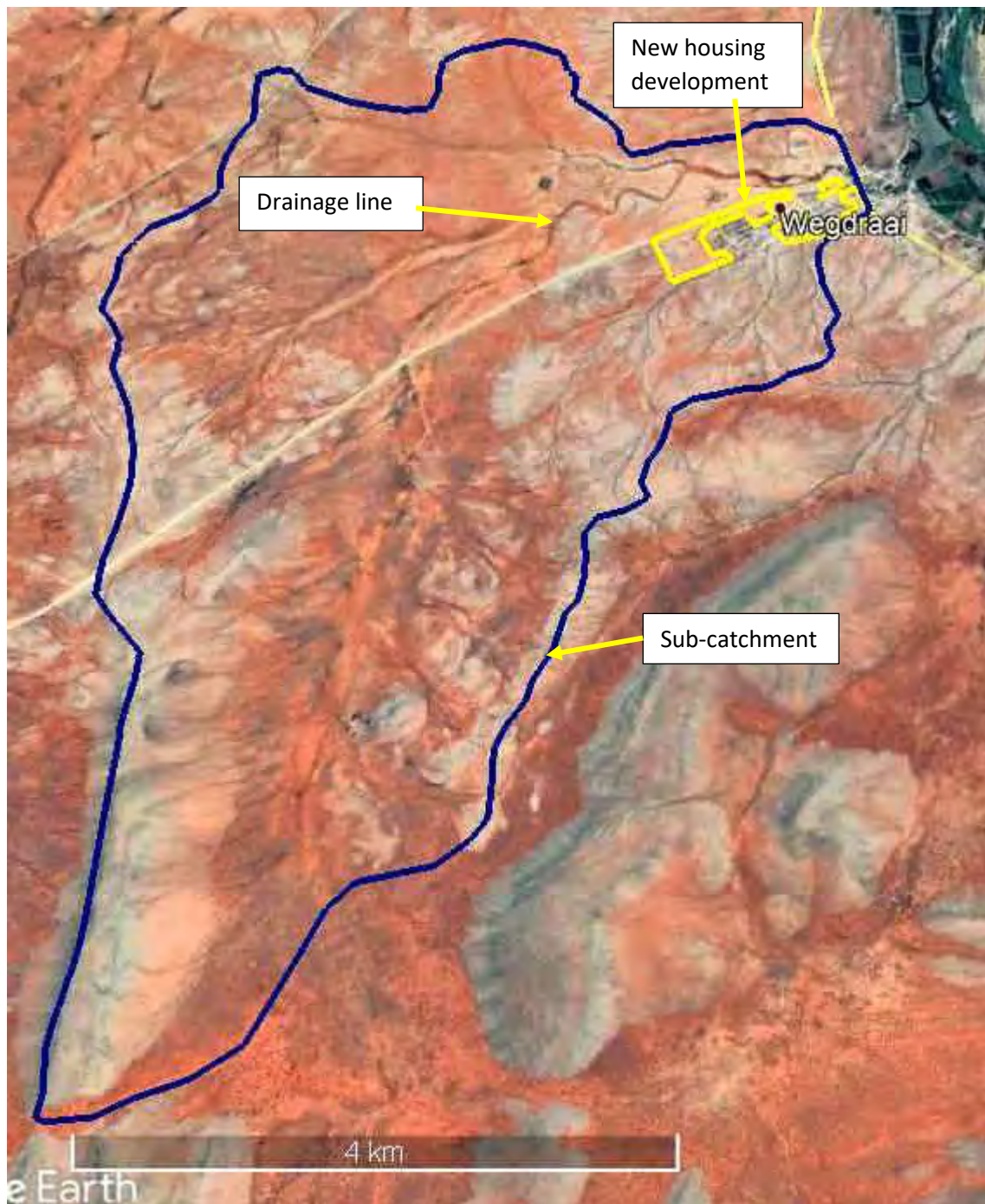


Figure 7 Wegdraai housing drainage line

The area of the sub-catchment (Figure 7) was estimated with Google Earth's polygon function. This can be done by connecting the highest points around the drainage line.

The sub-catchment covers an area of 3490ha, with a circumference of 29km. The drainage line rises on a dune field to the south west of Wegdraai. The drainage line

follows a wide bend around Wegdraai and passes the township to the north of its boundary.

The runoff from this drainage line does not flow through the township. Only 537ha of the sub-catchment contributes to the runoff through the township from a smaller tributary and its many small upper reaches to the south of the township.

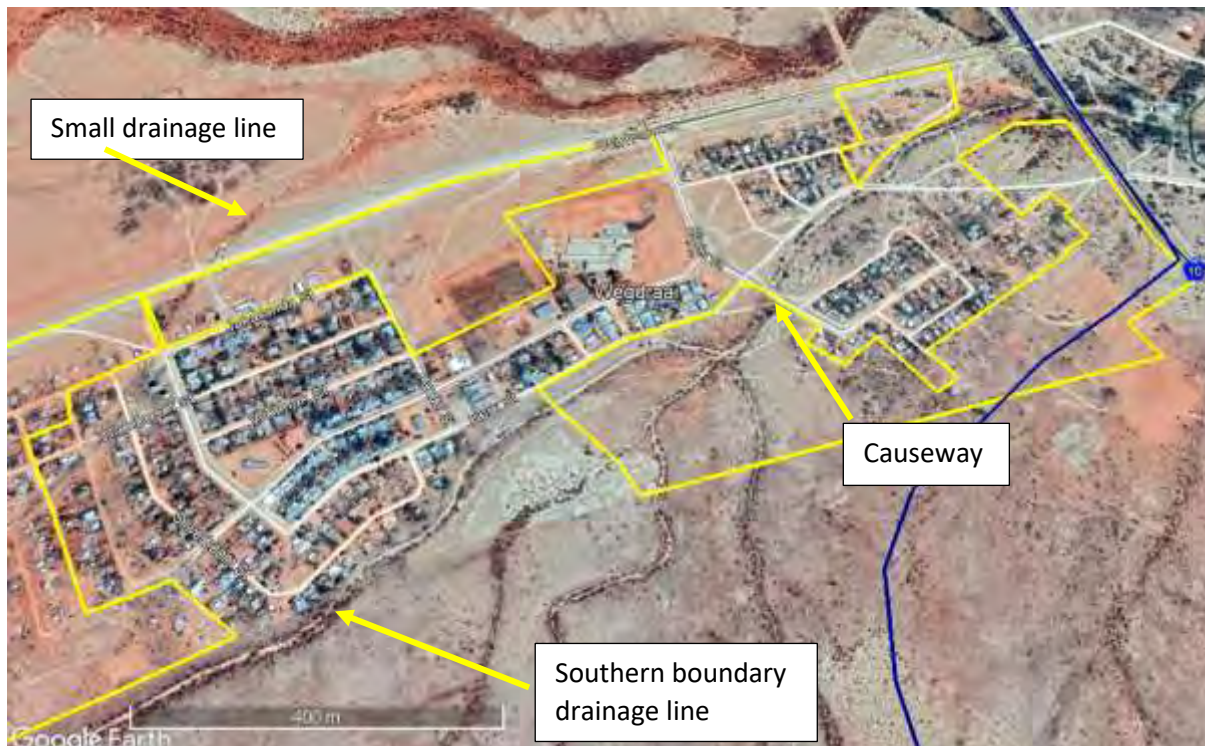


Figure 8 Southern boundary drainage line

The southern boundary drainage line (Figure 8) is a rather prominent feature of this part of town. It also serves as a depository of urban waste (Figure 9), signifying a collapse of municipal services. This problem would predictably grow to the next level of magnitude once the new area is built up.

The drainage line passes through town in a north westerly direction through a broad enough strip of open land to accommodate floods. It passes under a causeway in the middle of town (Figure 10 and 11).

There is another small drainage line through the western part of town (Figure 12), which actually flows into the large drainage line to the north of town (Figure 7). In town appears as a wide and shallow strip of land, with mostly swarthaak bushes. Outside of town, to the west, it still has its original drainage line features (Figure 13).



Figure 9 Urban waste



Figure 10 Causeway



Figure 11 Causeway Continued



Figure 12 Small drainage line



Figure 13 Small drainage line to the west



Figure 14 Bridge

The dirt road to Kenhardt from the N10 trunk road passes the north boundary of Wegdraai. Where it crosses the larger drainage line close to the N10 next to the town is a proper bridge, not only a mere culvert (Figure 14). From here the direction of the drainage line turns sharp south for a short distance along the N10 and then turns again to pass underneath the N10 through even a bigger bridge (Figure 15).



Figure 15 N10 road bridge

These bridges have been built to accommodate floods of a substantial magnitude, even in this arid area. Fortunately for Wegdraai, these floods do not pass through town, as the major drainage line is to the north of the town's boundary.

From the N10 Road Bridge, the drainage line is more or less natural, but when it reaches the vineyards it has been straightened and channeled, as most drainage lines are along the Lower Orange River. It makes a sharp bend through the reeds to its confluence with the Orange River (Figure 16).



Figure 16 Confluence

Farm animals were kept in enclosures within the 32m buffer zone of the drainage line along the Wegkeer southern boundary (Figure 17).

There were graves as well (Figure 18).



Figure 17 Farm animal enclosure



Figure 18 Graves

11 Biomonitoring the Lower Orange River

The biomonitoring was carried out according to the description of Dickens & Graham (2002).

Biomonitoring was carried out on the Lowers Orange River during site visits for successive WULAs. So far 12 samples have been analyzed at 11 localities (Table 1). The site furthest east was at Hopetown and furthest west at Augrabies, with Upington in the middle. All of these are located upstream of the Augrabies Falls.

Another sample was analyzed at Styerkraal just east of the border post of Onseepkans downstream of the Augrabies Falls.

The river is mostly braided, with many smaller streams and with islands in the middle. The river sports many rapids and riffles, but also pool-like features where the river is broad and slower flowing.

The bottom is mainly muddy, with some large rocky outcrops in the middle of the river.

12 Impacts on the Lower Orange River

The river is heavily utilized for agriculture, with the banks entirely modified into cultured vineyards. A multitude of large electric water pumps have been placed in the river for abstracting large volumes of water for irrigation. Abstraction significantly lowers the flow in the river.

Berms for the purpose of flood protection have been constructed on the banks of the river for most of its length. These berms have been constructed by the Department of Water Affairs and now have been a feature of the landscape for many decades. The berms keep flood water out of adjacent agricultural land and has denaturalised the riparian zone.

The single most impact on the Orange River are the two very large dams, The Gariep Dam and the Vanderkloof Dam. The river flow has been modified to a much more even regime, different from the varied flow with high peak flows and low drought flows.

The Lower Orange River is lined with a dense system of mostly dry drainage lines. These drainage lines only flow during and shortly after heavy rains. Their contribution to the flow of the Orange River is insignificant. Most of the flow comes from the Lesotho Highlands and some from the Vaal River. However, many of these drainage lines have been transformed into engineered agricultural return flow furrows that carries the excess of over irrigation back to the Orange River. Agricultural return flow adds much to the nutrient load of the Orange River because runoff contains fertilizer. Nitrogen is added in large quantities. Since phosphorus readily binds to the soil, not much phosphorus is added.

Return flow can contain a heavy silt load, thereby elevating turbidity in the river.

It is suspected that pesticides in agricultural return flow have a heavy impact on biomonitoring results, significantly reducing the SASS5 score.

The banks of the Orange River in the area is densely overgrown with Spaanse Riet (*Arundo donax*). This is classified as an aggressive and exotic invasive plant, which effectively prevents access to the river. The reeds result in a homogeneous aquatic habitat. This lack of variation suppresses the SASS5 score, with only a limited number of aquatic macroinvertebrate species present in this habitat.

13 Lower Orange River Biomonitoring Results

The biomonitoring results have been captured in Table 1 and depicted in Figure 19.

The classes from A to F in Figure 19 has been assigned for mature rivers on flood plains such as the Lower Orange River.

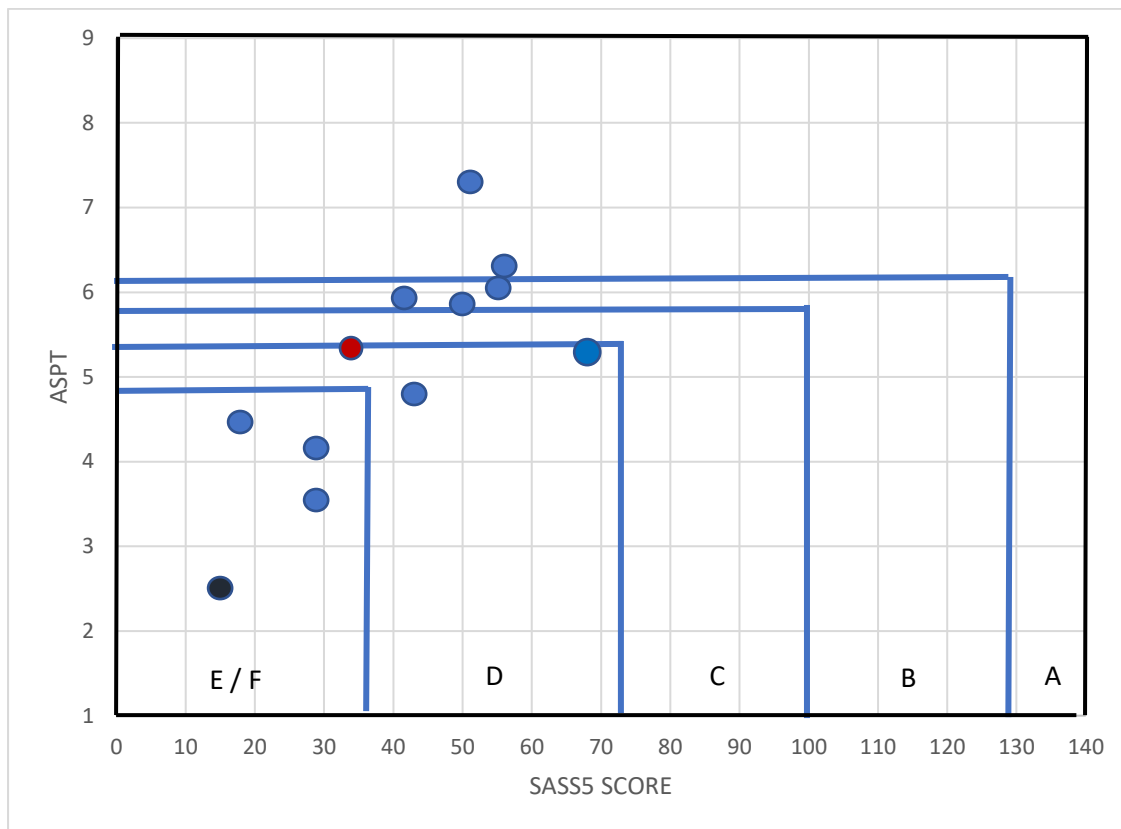
Only 2 of the samples were classified a good and relatively unimpacted (Class A). Four were in Class B and C, which can be regarded as acceptable under the circumstances of an impacted river reach. These classes can possible be labelled as the ideal, a compromise between agriculture and aquatic ecological functioning.

Four samples were poor (Classes E and F), an undesirable state of affairs.

The one sample downstream of the Augrabies Falls was extremely poor.

Table 1 Biomonitoring in the Lower Orange River

Locality	Coordinates	Date	SASS 5	No Taxa	ASPT
Augrabies Lair trust	28°38'41.53S 20°26'08.49E	5/09/17	18	4	4.5
Augrabies Lair Trust	28°38'41.53S 20°26'08.49E	5/10/17	43	9	4.8
Grobbershoop	28°52'31.80S 21°59'13.49E	14/8/18	41	7	5.9
Kakamas Triple D	28°45'08.37S 20°35'06.16E	15/8/18	50	9	5.6
Hopetown Sewer	29°36'05.07S 24°06'05.00E	7/10/18	29	7	4.1
Hopetown Sewer	29°36'08.06S 24°21'06.16E	7/10/18	29	8	3.6
Keimoes Housing	28°42'37.12S 20°55'07.81E	8/02/19	51	7	7.3
Upington Erf 323	28°27'11.91S 21°16'14.02E	12/2/19	56	9	6.2
Upington Affinity	28°27'11.91S 21°16'14.02E	20/5/19	54	9	6
Styerkraal	28°27'25.28S 21°15'01.87E	21/5/19	15	6	2.5
Grootdrink Bridge	28°17'15.30S 21°03'50.87E	17/5/20	34	7	5.3
Turksvy Dam	28°27'09.21S 21°17'20.72E	17/5/20	69	13	5.3



Integrity Class	Description
A	Pristine; not impacted
B	Very Good; slightly impacted
C	Good; measurably impacted with most ecological functioning intact
D	Fair; impacted with some loss of ecological functioning
E	Poor; loss of most ecological function
F	Very Poor; loss of all ecological function

Figure 19 Lower Orange River Biomonitoring Results

The red dot on the graph represents the result at the Grootdrink Bridge. All of the other dots represent previous sampling.

14 Sampling Site



Figure 20 Sampling Site



Figure 21 Orange River at Sampling Point

The sampling point (Figure 20, Figure 21) was chosen downstream as far as possible in order to pick up the combined impact of all of the housing projects along the reach of the Orange River from Boegoeberg to Grootdrink. This, of course, is not a realistic view, because the impact of agriculture would dwarf any other, if it could be separated, which is not possible. So, the reasoning is rather theoretical, not entirely realistic, but nevertheless required in terms of the WULA requirements.

However, if the cumulative impact of raw sewage from the many townships in the Orange River would ever realize as a threat, a biomonitoring result at this location would be of great benefit to assess the situation.

Moreover, sewage and its concomitant microbiological contamination would be a serious threat to the grape, other fruit and food export industry.

The sampling point was chosen because of accessibility. The dense stand of reeds renders most of the river's banks out of reach. There was a break in the reeds, probably kept open by local fishermen.

The available habitat was emerging vegetation (reeds), submerged vegetation (a single strand of parrot's feather), bedrock and muddy bottom.

The SASS5 score was only 34, which low and can be attributed to the limited available habitat. The ASPT came to 5.3, which can be expected for a mature river reach such as the Orange River at Grootdrink Bridge. The score indicated a "fair" rating, with some if it lost but with most ecological functioning still intact.

15 Present Ecological State (PES)

Table 2 Habitat Integrity according to Kleynhans, 1999

A	Unmodified, natural	90 – 100
B	Largely natural with few modifications. A small change in natural habitats and biota, but the ecosystem function is unchanged	80 – 89
C	Moderately modified. A loss and change of the natural habitat and biota, but the ecosystem function is predominantly unchanged	60 – 79
D	Largely modified. A significant loss of natural habitat, biota and ecosystem function.	40 – 59
E	Extensive modified with loss of habitat, biota and ecosystem function	20 – 39
F	Critically modified with almost complete loss of habitat, biota and ecosystem function. In worse cases ecosystem function has been destroyed and changes are irreversible	0 - 19

The upper sub-catchment is by far the largest part and is still in a near-pristine state, with only impact roads and grazing farm animals. Only the last reach has been modified by urban development and vineyards. The very last reach has been altered into an irrigation return flow drainage channel. This vast difference renders a valid evaluation difficult. How much weight must the impacted area carry opposed to the unimpacted area? Nevertheless, the WULA requires the best estimate.

The upper part would probably score a “B” rating and the last reach an “E”. The score for the entire instream sub-catchment came to a “C”; somewhat modified, but largely still intact.

The riparian zone scores a “B”; still in a good state, with some encroaching *Prosopis* trees in the lower reaches.

Table 3 Present Ecological State of the Drainage Line

Instream				
	Score	Weight	Product	Maximum score
Water abstraction	24	14	336	350
Flow modification	19	13	247	325
Bed modification	21	13	273	325
Channel modification	19	13	247	325
Water quality	19	14	266	350
Inundation	19	10	190	250
Exotic macrophytes	22	9	198	225
Exotic fauna	16	8	128	200
Solid waste disposal	5	6	30	150
Total		100	1915	2500
% of total			76.6	
Class			C	
Riparian				
Water abstraction	24	13	312	325
Inundation	19	11	209	275
Flow modification	19	12	228	300
Water quality	19	13	247	325
Indigenous vegetation removal	21	13	273	325
Exotic vegetation encroachment	19	12	228	300
Bank erosion	23	14	322	350
Channel modification	19	12	228	300
Total			2047	2500
% of total			81.9	
Class			B	

Much has been published on the ecological state of South African rivers and the Orange River is no exception. In fact, it seems somewhat arrogant to assess the Lower Orange River, even at the sampling point, with a team of one and with the financial backing of a single WULA. This is a large undertaking that is to be contemplated by a team of experts. Nevertheless, this is what the WULA requires.

The river at the Grootdrink sampling point, as elsewhere, has been impacted by major dams, large-scale water abstractions, an influx of agricultural chemicals, encroachment of reeds and exotic macrophytes, translocated and exotic fish, levees, bridges and many other infarctions.

Table 4 Present Ecological State Orange River

Instream				
	Score	Weight	Product	Maximum score
Water abstraction	15	14	210	350
Flow modification	15	13	195	325
Bed modification	20	13	260	325
Channel modification	22	13	286	325
Water quality	15	14	210	350
Inundation	12	10	120	250
Exotic macrophytes	18	9	162	225
Exotic fauna	15	8	120	200
Solid waste disposal	20	6	120	150
Total		100	1593	2500
% of total			63.7	
Class			C	
Riparian				
Water abstraction	15	13	195	325
Inundation	14	11	154	275
Flow modification	15	12	180	300
Water quality	15	13	195	325
Indigenous vegetation removal	15	13	195	325
Exotic vegetation encroachment	15	12	180	300
Bank erosion	20	14	280	350
Channel modification	18	12	216	300
Total			1595	2500
% of total			63.8	
Class			C	

However, the river at Grootdrink was less impacted than further downstream, as at Kakamas. The river at Grootdrink was stronger flowing, with much more water. The condition of the river gradually deteriorates as water abstraction and return flows increases downstream.

Hence the river was scored a C (Table 4), which signifies that it has been impacted, but despite these impacts still exhibits appreciable ecological functioning. The riparian zone scores a C as well.

There is a good chance that other practitioners would score the river very much the same.

Importantly, the proposed development at Groblershoop is not about to change the PES of the Orange River at Grootdrink.

16 Ecological Importance

The Ecological Importance (EI) is based on the presence of especially fish species that are endangered on a local, regional or national level (Table 5).

There are no fish in the drainage line, as there is no permanent water. According to this assessment, which is prescribed for WULA's, the drainage line is not important.

No other endangered species, either plant or animal, were detected in or near the drainage line.

Table 5 Ecological Importance according to endangered organisms (Kleynhans, 1999).

Category	Description
1	One species or taxon are endangered on a local scale
2	More than one species or taxon are rare or endangered on a local scale
3	More than one species or taxon are rare or endangered on a provincial or regional scale
4	One or more species or taxa are rare or endangered on a national scale (Red Data)

As has been stated before, the higher vegetation in and around the drainage lines are of particular importance in these arid regions and add significantly to biodiversity. These should be considered as ecologically important.

The Orange River is most important, according to this assessment.

According to Skelton (1993) 12 species of indigenous fish occur in the Lower Orange River. Since 2011 another one was added, as well as 3 exotic species. These are the following:

Barbus trimaculatus
B paludinosus
B. hospus
Labeobarbus kimberleyensis (Near threatened)
L aenus
Labeo umbratus
L capensis
Austroglanis sclateri (Widespread elsewhere)
Clarias gariepinus
Pseudocrenilabrus philander (Threatened locally but abundant elsewhere)
Pseudobarbus quathlabae
Mesobola brevianalis (critically endangered)

Exotic and translocated fish:

Cyprinus carpio
Tilapia sparrmanii
Oreochromus mossambicus

Those in blue are endangered to a varying extent. Those indicated in red are exotic or translocated fish.

The only one that causes real concern in the largemouth yellow-fish *Labeobarbus kimberleyensis*. It is endemic to the Orange River system and hence is threatened not only on a local scale, but on a national scale as well. This puts the Lower Orange in category 4. This renders the Orange River as important.

According to the owners of the Kalahari River and Safari Co. along the northern bank of the Orange River on the Riemvasmaak Road, mature blue kurper *Oreochromus mossambicus* are regularly captured in increasing numbers. It now takes at least 4 man-days to capture a single yellow fish.

Yellow fish are generally infected with cestode bladder worms, while darters (*Anhinga rufa*) that predate on these fish are heavily infected with tape worms. It seems as if the translocated Tilapia are not affected by these parasites.

According to Mr Chris van der Post, a renown angling guide and the owner of the Gkhui Gkhui River Lodge near Hopetown, there are still many smallmouth-yellow fish around, but largemouth yellow-fish are scarce.

17 Ecological Sensitivity

Ecological Sensitivity (ES) is often described as the ability of aquatic habitat to assimilate impacts. It is not sensitive if it remains the same despite of the onslaught of impacts. Put differently, sensitive habitat changes substantially, even under the pressure of slight impacts.

The Ecological Sensitivity also refers to the potential of aquatic habitat to bounce back to an ecological condition closer to the situation prior to human impact. If it recovers, it is not regarded as sensitive.

17.1 Ecological Sensitivity Drainage Line

The question arises, according to the ES definition, if the drainage lines would recover to its original ecological state prior to any human impact. If the roads and vineyards, along with the rubble and trash be removed, would the drainage line recover? The answer is probably yes, even though the drainage lines would find new routes and even though it would take many decades, perhaps more than a century, in this semi-arid region where re-growth of vegetation can take a long time. However, this is not a realistic scenario. Development is here to stay, together with its impacts. From this point of view the drainage line can be considered as ecologically sensitive.

17.2 Ecological Sensitivity Orange River

The Lower Orange River has absorbed numerous and deep-cutting human impacts. Yet it still functions as an aquatic ecosystem. In the highly improbable event of ceased human impact, the river here would probably bounce back to its previous glory. In this respect the river cannot be categorised as sensitive. It is dreaded among conservation minded people that the Lower Orange River might have some more capacity to absorb further impact.

18 Probable Impacts

The existing impacts on the aquatic environment would increase, should the proposed development go ahead. These impacts include more household waste down the drainage line.

The sewage situation has not been assessed, as the WWTWs is outside of town to the north. It seems possible that should there ever be a sewage spill that the larger drainage line to the north of town could be affected. During the site visit there was no indication of such an event. The state and functionality of the WWTW has not been assessed.

With more people, more farm animals can be expected, along with holding pens on the banks of the drainage line, with the concomitant destruction of the ecological functioning.

Likewise, more graves can be expected in the softer soils of the alluvium.

Reportedly the *Prosopis* trees gradually increase in numbers up the sub-catchment.

The cumulative impact of all developments along the Orange River in the !Kheis municipality can be substantial.

19 Mitigation Measures

Municipal serviced should resume prior to the approval of the proposed urban development. Waste management is of primary importance.

Farm animal numbers should be controlled to the carrying capacity of the area and pens should be kept outside of the buffer zones.

Graveyards should be provided for outside the buffer zones of drainage lines.

Prosopis trees should be controlled according to a programme and a budget.

20 Impact Assessment

Table 6 Impact Assessment

Description of impact Cumulative impact of solid waste ending up in the drainage line and Orange River								
Mitigation measures Resume municipal services								
Type Nature	Spatial Extent	Severity	Duration	Significance	Probability	Confidence	Reversibility	Irreplaceability
Without mitigation								
Cumulative	Regional	Medium	Long term	Medium	Probable	Certain	Reversible	Replaceable
With mitigation measures								
Cumulative	Local	Low	Long term	Low	Unlikely	Sure	Reversible	Replaceable

Description of impact Impact of graves and farm animals on the riparian zone, trampling, destruction of ecological functioning								
Mitigation measures Provide official graveyards Keep animal pens out of the riparian zone.								
Type Nature	Spatial Extent	Severity	Duration	Significance	Probability	Confidence	Reversibility	Irreplaceability
Without mitigation								
Cumulative	Regional	Medium	Long term	Medium	Probable	Certain	Reversible	Replaceable
With mitigation measures								
Cumulative	Local	Low	Long term	Low	Unlikely	Sure	Reversible	Replaceable

Some of the decision-making authorities prescribe an impact assessment according to a premeditated methodology (Table 23.1, Appendix).

The main benefit of this exercise is that it allows for the evaluation of mitigation measures. Later follows the Risk Matrix. This is different from the Impact Assessment as it does not attempt to weigh the success of mitigation measures.

The assessment indicates that the impacts are acceptable, provided that the mitigation measures are adequate to contain these impacts (Table 6). The impact is reduced from “medium” to “low”, provided the proper municipal services resume.

21 Risk Matrix

The purpose of the Risk Matrix is to determine if a General Authorisation of a License is applicable.

The assessment was carried out according to the interactive Excel table that is available on the DWS webpage. Table 7 is a replica of the Excel spreadsheet that has been adapted to fit the format of this report. The numbers in Table 7 (continued) represent the same activities as in Table 7, with sub-activities added.

The methodology is tabled in the Appendix.

The risks to the aquatic environment are small, mainly because of the scale of the disturbances. The existing urban area as well as the proposed additional area are

small in relation to the rest of the sub-catchment, hence the risks are rated as small. However, if the accumulation of waste is allowed to continue unabated, the risks would increase.

The risk of a sewage spill down the drainage line and into the Orange River is not apparent at this stage.

The risk increases because of the cumulative risks posed by the various developments along the reach of the Orange River. It is supposed that if the contamination in the river rises and the farming community becomes aware of it, that there would be a strong reaction, leading to curbing or ending the problem. This assumption influenced the score for “duration”, as the problem was perceived not to continue.

In most cases loosened soil and silt that can be washed down the drainage lines during construction are considered to be a risk to the aquatic environment. In the event of the Wegdraai development, the risk is so small that it is not worth considering in a Risk Matrix.

The Risk Matrix indicates that the risks to the aquatic environment are low. A General Authorisation should be in order for this application and a License is deemed not to be the indicated level of authorisation.

Table 7 Risk Matrix

No.	Activity	Aspect	Impact	Significance	Risk Rating
1	Urban solid waste	Waste ending up in the drainage line and in the river	Sewage contamination in the drainage line and Orange River	45	Low
2	Animal husbandry	Pens in drainage line and trampling	Destruction of ecological functioning	54	Low
3	Graves	Digging in drainage lines	Destruction of ecological functioning	54	Low

Table 7 Continued Risk Rating

No	Flow	Water Quality	Habitat	Biota	Severity	Spatial scale	Duration	Consequence
1	1	2	2	1	1.5	1	2	4.5
2	1	2	2	1	1.5	1	2	4.5
3	1	1	2	1	1.5	1	2	4.5

No	Frequency of activity	Frequency of impact	Legal issues	Detection	Likelihood	Significance	Risk Rating
1	2	2	5	1	10	45	Low
2	3	3	5	1	12	54	Low
3	3	3	5	1	12	54	Low

22 Resource Economics

Table 8. Goods and Services

Goods & Services	Score
Flood attenuation	4
Stream flow regulation	4
Sediment trapping	3
Phosphate trapping	2
Nitrate removal	2
Toxicant removal	2
Erosion control	3
Carbon storage	2
Biodiversity maintenance	5
Water supply for human use	0
Natural resources	0
Cultivated food	1
Cultural significance	0
Tourism and recreation	0
Education and research	0

0	Low
5	High

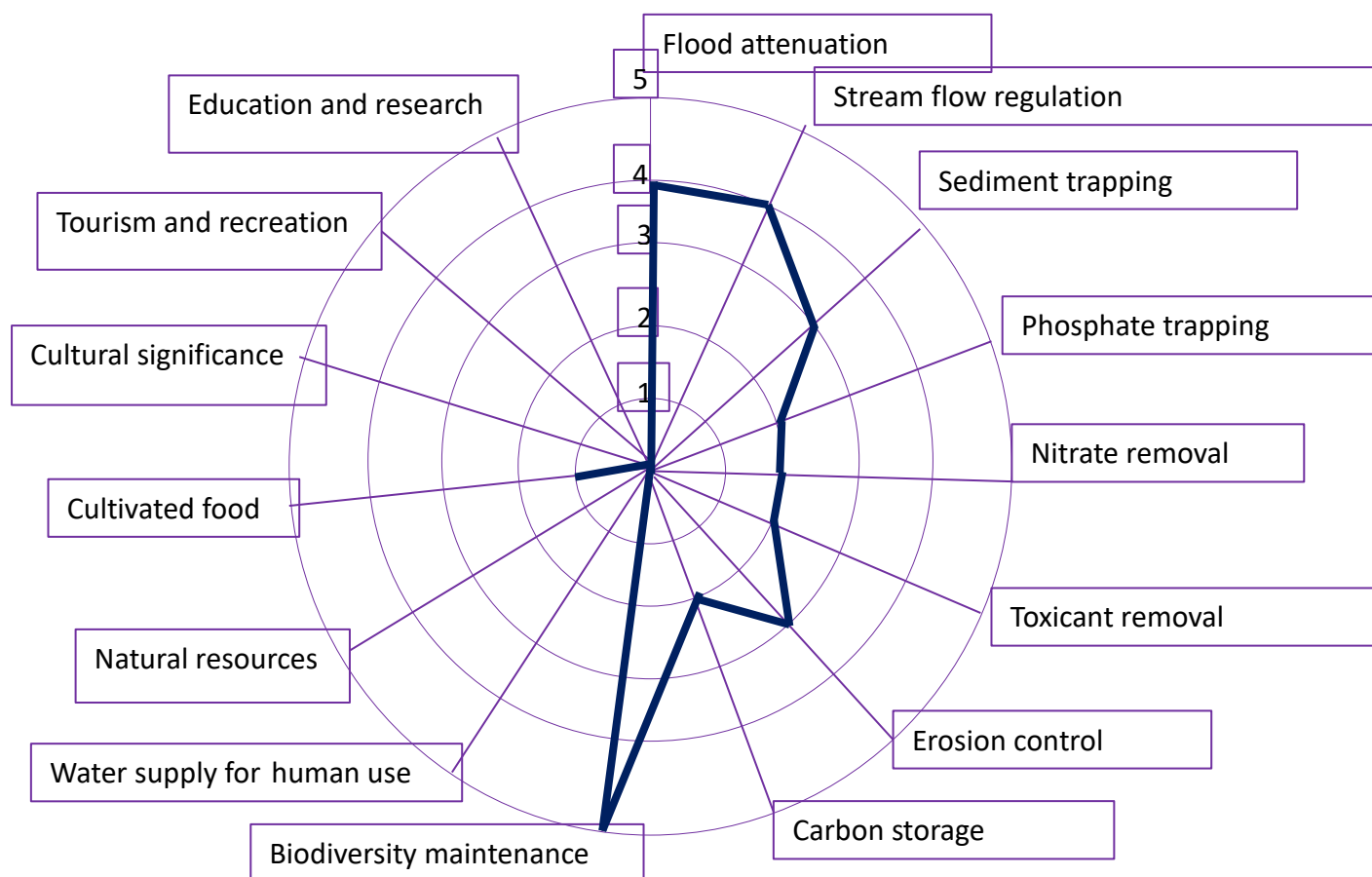


Figure 22. Resource Economics Footprint of the Drainage Line

The goods and services delivered by the environment, in this case the drainage line at the new Wegdraai housing development, is a Resource Economics concept as adapted by Kotze *et al* (2009). The methodology was designed for the assessments of wetlands, but in the case of the drainage line the goods and services delivered are particularly applicable and important, hence it was decided to include it in the report.

The diagram (Figure 22) is an accepted manner to visually illustrate the resource economic footprint the drainage line, from the data in Table 8.

The size of the star shape attracts the attention of the decision-makers. This shape (spider diagram, Figure 22) is small, indicating that the water course has a small economic foot print. Its single biggest contribution is one of biodiversity, relative to its otherwise barren landscape.

23 Site Visits: General Observations

Pertaining to Fresh Water Reports in general, urban wastewater is of importance because untreated waste ends up in water ways, which rebels against the NWA and other contemporary South African environmental legislation. Photographic evidence is presented in several of the seven !Kheis townships where anaerobic pond systems for the treatment of sewage lie idle and are not being utilized for the treatment of urban sewage. Instead raw sewage is dumped in drainage lines. Likewise, several sewage pump stations are dysfunctional, overflowing, with large quantities of raw sewage flowing down drainage lines.

Household solid waste is not collected and removed according to standard municipal operating procedures. Very large quantities of waste accumulate in the townships and the streets. Large quantities of waste end up in the drainage lines as well.

These two aspects are crucial to the WULA and environmental authorisation of any further urban development. If these malpractices are allowed to continue and if the normal municipal services continue to be absent, this untenable situation would become worse when these townships expand.

It should be noted that functional municipal services are part and parcel of the !Kheis Municipality's Technical Director's KPA's, stated in his published service contract. However, wastewater and solid waste management are not pertinently mentioned in this contract, which may explain why these services are not satisfactory.

This is not only a tangible threat to human health and human well-being at !Kheis, but in many South African municipalities, as well as in cities elsewhere in the world where WATSAN Africa concluded contracts.

In a number of the townships, graveyards are illegally located right in drainage lines or within the 32m buffer zone from drainage lines.

There is no shortage of the aloe *Aloe claviflora* (Figure 22) in the district. They are plentiful and not endangered in any way, although aloes are protected plants in terms of legislation. These aloes are cleared from plots where people are putting up their houses. There will be a major clearance once the new housing schemes are launched. These aloes have a considerable monetary value if sold in cities such as Pretoria, Johannesburg and Cape Town. A formal scheme should be devised to collect and sell these aloes, the proceeds could be transferred to a reputable NGO, for community-based projects, such as building class rooms or additions to clinics.

From a Fresh Water Report perspective, a Licence or General authorisation should probably not be granted until the sewage and waste issues are satisfactory and

sustainably resolved. But then this is entirely the prerogative of the DWS and its officials.



Figure 23 *Aloe claviflora*

24 Conclusions

Figure 24 has been adapted from one of the most recent DWS policy documents.

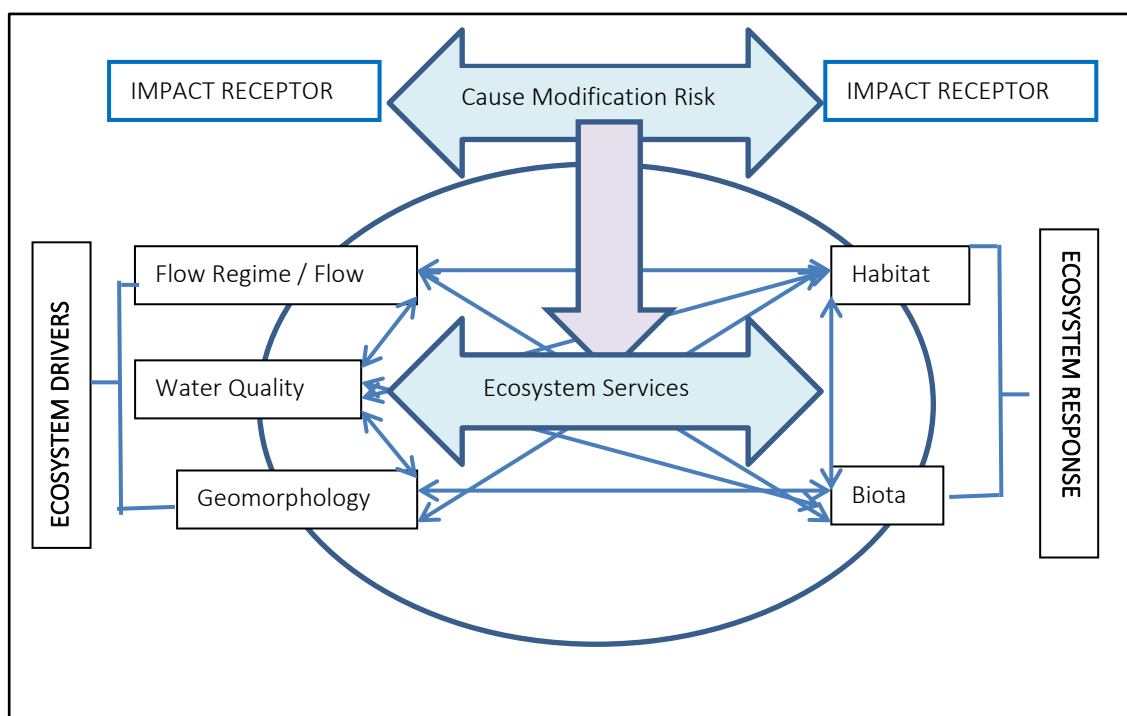


Figure 24 Minimum Requirements for a S21(c) and (i) Application

An anthropogenic activity can impact on any of the ecosystem drivers or responses and this can have a knock-on effect on all of the other drivers and responses. This, in turn, will predictably impact on the ecosystem services (Figure 24). The WULA and the EAI must provide mitigation measured for these impacts.

The driver of the drainage line is the occasional flood that follows sudden and intense rainfall events. This is followed by prolonged droughts and intense summer heat that prevents the development of any viable aquatic habitat. This is apart from shallow ground water that explains the growth of a somewhat more prolific vegetation along the drainage lines.

The current solid waste situation is a threat to the WULA. The authorities may insist that this issue be resolved before a General Authorization is approved.

Apart from this, the findings of this Fresh Water Report indicate that a general Authorization would be in order for the development of an urban housing scheme at Wegdraai.

25 References

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Skelton, P. 1993. *Freshwater Fishes of Southern Africa*. Southern Book Publishers, Halfway House.

26 Declaration of Independence

I, Dirk van Driel, as the appointed independent specialist hereby declare that I:

- Act/ed as the independent specialist in this application
- Regard the information contained in this report as it relates to my specialist input/study to be true and correct and;
- Do not have and will not have any financial interest in the undertaking of the activity, other than remuneration for work performed in terms of the NEMA, the Environmental Impact Assessment Regulations, 2010 and any specific environmental management act;
- Have and will not have vested interest in the proposed activity;
- Have disclosed to the applicant, EAP and competent authority any material information have or may have to influence the decision of the competent authority or the objectivity of any report, plan or document required in terms of the NEMA, the environmental Impact Assessment Regulations, 2010 and any specific environmental management act.
- Am fully aware and meet the responsibilities in terms of the NEMA, the Environmental Impacts Assessment Regulations, 2010 (specifically in terms of regulation 17 of GN No. R543) and any specific environmental management act and that failure to comply with these requirements may constitute and result in disqualification;
- Have ensured that information containing all relevant facts on respect of the specialist input / study was distributed or made available to interested and affected parties and the public and that participation by interested and affected parties facilitated in such a manner that all interested and affected parties were provided with reasonable opportunity to participate and to provide comments on the specialist input / study;
- Have ensured that all the comments of all the interested and affected parties on the specialist input were considered, recorded and submitted to the competent authority in respect of the application;
- Have ensured that the names of all the interested and affected parties that participated in terms of the specialist input / study were recorded in the register of interested and affected parties who participated in the public participation process;
- Have provided the competent authority with access to all information at my disposal regarding the application, whether such information is favourable or not and;
- Am aware that a false declaration is an offence in terms of regulation 71 of GN No. R543.

Signature of the specialist:



9 June 2020

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Experience

WATSAN Africa, Cape Town. Scientist **2011 - present**

USAID/RTI, ICMA & Chemonics. Iraq & Afghanistan **2007 -2011**
 Program manager.

City of Cape Town **1999-2007**
 Acting Head: Scientific Services, Manager: Hydrobiology.

Department of Water & Sanitation, South Africa **1989 – 1999**
 Senior Scientist

Tshwane University of Technology, Pretoria **1979 – 1998**
 Head of Department

University of Western Cape and Stellenbosch University 1994- 1998 part-time

- Lectured post-graduate courses in Water Management and Environmental Management to under-graduate civil engineering students
- Served as external dissertation and thesis examiner

Service Positions

- Project Leader, initiator, member and participator: Water Research Commission (WRC), Pretoria.
- Director: UNESCO West Coast Biosphere, South Africa
- Director (Deputy Chairperson): Grotto Bay Home Owner's Association
- Member Dassen Island Protected Area Association (PAAC)

Membership of Professional Societies

- South African Council for Scientific Professions. Registered Scientist No. 400041/96
- Water Institute of South Africa. Member

Reports

- Process Review Kathu Wastewater Treatment Works
- Effluent Irrigation Report Tydstroom Abattoir Durbanville
- River Rehabilitation Report Slangkop Farm, Yzerfontein
- Fresh Water and Estuary Report Erf 77 Elands Bay
- Ground Water Revision, Moorreesburg Cemetery
- Fresh Water Report Delaire Graff Estate, Stellenbosch
- Fresh Water Report Quantum Foods (Pty) Ltd. Moredou Poultry Farm, Tulbagh
- Fresh Water Report Revision, De Hoop Development, Malmesbury
- Fresh Water Report, Idas Valley Development Erf 10866, Stellenbosch
- Wetland Delineation Idas Valley Development Erf 10866, Stellenbosch
- Fresh Water Report, Idas Valley Development Erf 11330, Stellenbosch
- Fresh Water Report, La Motte Development, Franschhoek
- Ground Water Peer Review, Elandsfontein Exploration & Mining
- Fresh Water Report Woodlands Sand Mine Malmesbury
- Fresh Water Report Brakke Kuyl Sand Mine, Cape Town
- Wetland Delineation, Ingwe Housing Development, Somerset West
- Fresh Water Report, Suurbraak Wastewater Treatment Works, Swellendam
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- Storm Water Management Plan, Riverside Quarry
- Water Quality Irrigation Dams Report, Langebaan Country Estate
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- Wetland Delineation Erf 599, Betty's Bay
- Technical Report Bloodhound Land Speed Record, Hakskeenpan
- Technical Report Harkerville Sand Mine, Plettenberg Bay
- Technical Report Doring Rivier Sand Mine, Vanrhynsdorp
- Rehabilitation Plan Roodefontein Dam, Plettenberg Bay
- Technical Report Groenvlei Crusher, Worcester
- Technical Report Wiedouw Sand Mine, Vanrhynsdorp
- Technical Report Lair Trust Farm, Augrabies
- Technical Report Schouwtoneel Sand Mine, Vredenburg
- Technical Report Waboomsrivier Weir Wolseley
- Technical Report Doornkraal Sand Mine Malmesbury
- Technical Report Berg-en-Dal Sand Mine Malmesbury
- Wetland Demarcation, Osdrif Farm, Worcester
- Technical Report Driefontein Dam, Farm Agterfontein, Ceres
- Technical Report Oewerzicht Farm Dam, Greyton
- Technical Report Glen Lossie Sand Mine, Malmesbury
- Preliminary Report Stellenbosch Cemeteries
- Technical Report Toeka & Harmony Dams, Houdenberg Farm, Koue Bokkeveld
- Technical Report Kluitjieskraal Sand & Gravel Mine, Swellendam
- Fresh Water Report Urban Development Witteklip Vredenburg
- Fresh Water Report Groblershoop Resort, Northern Cape
- Fresh Water Report CA Bruwer Quarry Kakamas, Northern Cape
- Fresh Water Report, CA Bruwer Sand Mine, Kakamas, Northern Cape
- Fresh Water Report, Triple D Farms, Agri Development, Kakamas
- Fresh Water Report, Keren Energy Photovoltaic Plant Kakamas
- Fresh Water Report, Keren Energy Photovoltaic Plant Hopetown

- Fresh Water Report Hopetown Sewer
- Fresh Water Report Hoogland Farm Agricultural Development, Touws River
- Fresh Water Report Klaarstroom Waste Water Treatment Works
- Fresh Water Report Calvinia Sports Grounds Irrigation
- Fresh Water Report CA Bruwer Agricultural Development Kakamas
- Fresh Water Report Zwartfontein Farm Dam, Hermon
- Statement Delsma Farm Wetland, Hermon
- Fresh Water Report Lemoenshoek Farms Pipelines Bonnyvale
- Fresh Water Report Water Provision Pipeline Brandvlei
- Fresh Water Report Erf 19992 Upington
- Botanical Report Zwartejongensfontein Sand Mine, Stilbaai
- Fresh Water Report CA Bruwer Feldspath Mine, Kakamas
- Sediment Yield Calculation, Kenhardt Sand Mine
- Wetland Demarcation, Grabouw Traffic Center
- Fresh Water Report, Osdrift Sand Mine, Worcester
- Fresh Water Report, Muggievlak Storm Water Canal, Vredenburg
- Fresh Water Report, Marksman's Nest Rifle Range, Malmesbury
- Biodiversity Report, Muggievlak Storm Water Canal, Vredenburg
- Strategic Planning Report, Sanitation, Afghanistan Government, New Delhi, India
- Fresh Water Report, Potable Water Pipeline, Komaggas
- Fresh Water Report, Wastewater Treatment Works, Kamieskroon
- Fresh Water Report Turksvy Farm Agricultural Development, Upington

28 Appendix

28.1 Biomonitoring Score Sheet

SASS5 Score Sheet										
Date	17 May 20	Taxon	Weight	Score	Taxon	Weight	Score	Taxon	Weight	Score
Locality	Orange River	Porifera	5		Hemiptera			Diptera		
	Grootdrink Bridge	Coelenterata	1		Belostomatidae	3		Athericidae	10	
		Turbellaria	3		Corixidae	3	3	Blepharoceridae	15	
		Oligochaeta	1		Gerridae	5		Ceratopogonidae	5	
Coordinates	28°27' 15.30"	Huridinea	3		Hydrometridae	6		Chironomidae	2	2
	21°17'03.50"	Crustacea			Naucoridae	7		Culicidae	1	
		Amphipodae	13		Nepidae	3		Dixidae	10	
DO mg/l	8.6	Potamonautidae	3		Notonectidae	3	3	Empididae	6	
Temperature °C	17.2	Atyidae	8	8	Pleidae	4	4	Ephyridae	3	
pH	7.15	Palaemonidae	10		Veliidae	5		Muscidae	1	
EC mS/m	33	Hydracarina	8		Megaloptera			Psychodidae	1	
		Plecoptera			Corydalidae	10		Simuliidae	5	5
SASS5 Score	34	Notonemouridae	14		Sialidae	8		Syrphidae	1	
Number of Taxa	7	Perlidae	12		Trichoptera			Tabanidae	5	
ASPT	5.3	Ephemeroptera			Dipseudopsidae	10		Tipulidae	5	
		Baetidae 1 sp	4	4	Ecnomidae	8		Gastropoda		
Other Biota	Tadpoles	Baetidae 2 sp	6		Hydropsychidae 1 sp	4		Ancylidae	6	
		Baetidae >3 sp	12		Hydropsychidae 2 sp	6		Bulinidae	3	
		Caenidae	6		Hydropsychidae <2 sp	12		Hydrobiidae	3	
		Ephemeridae	15		Phlypotamidae	10		Lymnaeidae	3	
		Heptageniidae	13		Polycentropodidae	12		Physidae	3	
		Leptophlebiidae	9		Psychomyidae	8		Planorbidae	3	
		Oligoneuridae	15		Cased Caddis			Thiaridae	3	
Comments		Polymitarcyidae	10		Barbarochthonidae	13		Viviparidae	5	
		Prosopistomatida	15		Calamoceratidae	11		Pelecypoda		
		Teloganodidae	12		Glossostomatidae	11		Corbiculidae	5	
		Trichorythidae	9		Hydroptilidae	6		Sphariidae	3	
		Odonata			Hydrosalpingidae	15		Unionidae	6	
		Calopterygidae	10		Leptostomatidae	10				
		Clorocyphidae	10		Leptoceridae	6				
		Chorolestidae	8		Petrothrincidae	11				
		Coenagrionidae	4		Pisulidae	10				
		Lestidae	8		Sericostomatidae	13				
		Platycnemidae	10		Coleoptera					
		Protoneuridae	8		Dyticidae	5	5			
		Aesthniidae	8		Elmidae Dryopidae	8				
		Corduliidae	8		Gyrinidae	5				
		Gomphidae	6		Haliplidae	5				
		Libellulidae	4		Helodidae	12				
		Lepidoptera			Hydraenidae	8				
		Pyrilidae	12		Hydrophilidae	5				
					Limnichidae	10				
					Psephenidae	10				
Score				12			15			7

28.2 Methodology used in determining significance of impacts

The methodology to be used in determining and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks associated with the alternatives is provided in the following tables:

Table 28.2.1 Nature and type of impact

Nature and type of impact	Description
Positive	An impact that is considered to represent an improvement to the baseline conditions or represents a positive change
Negative	An impact that is considered to represent an adverse change from the baseline or introduces a new negative factor
Direct	Impacts that result from the direct interaction between a planned project activity and the receiving environment / receptors
Indirect	Impacts that result from other activities that could take place as a consequence of the project (e.g. an influx of work seekers)
Cumulative	Impacts that act together with other impacts (including those from concurrent or planned future activities) to affect the same resources and / or receptors as the project

Table 28.2.2 Criteria for the assessment of impacts

Criteria	Rating	Description
Spatial extent of impact	National	Impacts that affect nationally important environmental resources or affect an area that is nationally important or have macro-economic consequences
	Regional	Impacts that affect regionally important environmental resources or are experienced on a regional scale as determined by administrative boundaries or habitat type / ecosystems
	Local	Within 2 km of the site
	Site specific	On site or within 100m of the site boundary
Consequence of impact/ Magnitude/ Severity	High	Natural and / or social functions and / or processes are severely altered
	Medium	Natural and / or social functions and / or processes are notably altered
	Low	Natural and / or social functions and / or processes are slightly altered
	Very Low	Natural and / or social functions and / or processes are negligibly altered
	Zero	Natural and / or social functions and / or processes remain unaltered
Duration of impact	Temporary	Impacts of short duration and /or occasional
	Short term	During the construction period
	Medium term	During part or all of the operational phase
	Long term	Beyond the operational phase, but not permanently
	Permanent	Mitigation will not occur in such a way or in such a time span that the impact can be considered transient (irreversible)

Table 28.2.3 Significance Rating

Significance Rating	Description
High	<p>High consequence with a regional extent and long-term duration</p> <p>High consequence with either a regional extent and medium-term duration or a local extent and long-term duration</p> <p>Medium consequence with a regional extent and a long-term duration</p>
Medium	<p>High with a local extent and medium-term duration</p> <p>High consequence with a regional extent and short-term duration or a site-specific extent and long-term duration</p> <p>High consequence with either local extent and short-term duration or a site-specific extent with a medium-term duration</p> <p>Medium consequence with any combination of extent and duration except site-specific and short-term or regional and long term</p> <p>Low consequence with a regional extent and long-term duration</p>
Low	<p>High consequence with a site-specific extent and short-term duration</p> <p>Medium consequence with a site-specific extent and short-term duration</p> <p>Low consequence with any combination of extent and duration except site-specific and short-term</p> <p>Very low consequence with a regional extent and long-term duration</p>
Very low	<p>Low consequence with a site-specific extent and short-term duration</p> <p>Very low consequence with any combination of extent and duration except regional and long term</p>
Neutral	Zero consequence with any combination of extent and duration

Table 28.2.4 Probability, confidence, reversibility and irreplaceability

Criteria	Rating	Description
Probability	Definite	>90% likelihood of the impact occurring
	Probable	70 – 90% likelihood of the impact occurring
	Possible	40 – 70% likelihood of the impact occurring
	Unlikely	<40% likelihood of the impact occurring
Confidence	Certain	Wealth of information on and sound understanding of the environmental factors potentially affecting the impact
	Sure	Reasonable amount of useful information on and relatively sound understanding of the environmental factors potentially influencing the impact
	Unsure	Limited useful information on and understanding of the environmental factors potentially influencing this impact
Reversibility	Reversible	The impact is reversible within 2 years after the cause or stress is removed
	Irreversible	The activity will lead to an impact that is in all practical terms permanent
Irreplaceability	Replaceable	The resources lost can be replaced to a certain degree
	Irreplaceable	The activity will lead to a permanent loss of resources.

28.3 Risk Matrix Methodology

RISK ASSESSMENT KEY (Referenced from DWA RISK-BASED WATER USE AUTHORISATION APPROACH AND DELEGATION GUIDELINES)		
Negative Rating		
TABLE 1- SEVERITY		
How severe does the aspects impact on the environment and resource quality characteristics (flow regime, water quality, geomorfology, biota, habitat)		
Insignificant / non-harmful	1	
Small / potentially harmful	2	
Significant / slightly harmful	3	
Great / harmful	4	
Disastrous / extremely harmful and/or wetland(s) involved	5	
Where "or wetland(s) are involved" it means		
TABLE 2 – SPATIAL SCALE		
How big is the area that the aspect is impacting on?		
Area specific (at impact site)	1	
Whole site (entire surface right)	2	
Regional / neighbouring areas (downstream within quaternary catchment)	3	
National (impacting beyond secondary catchment or provinces)	4	
Global (impacting beyond SA boundary)	5	
TABLE 3 – DURATION		
How long does the aspect impact on the environment and resource quality?		
One day to one month, PES, EIS and/or REC not impacted		
One month to one year, PES, EIS and/or REC impacted but no change in status		
One year to 10 years, PES, EIS and/or REC impacted to a lower status but can be improved over this period through mitigation		
Life of the activity, PES, EIS and/or REC permanently lowered		
More than life of the organisation/facility, PES and EIS scores, a E or F		
TABLE 4 – FREQUENCY OF THE ACTIVITY		
How often do you do the specific activity?		
Annually or less	1	
6 monthly	2	
Monthly	3	
Weekly	4	
Daily	5	
TABLE 5 – FREQUENCY OF THE INCIDENT/IMPACT		
How often does the activity impact on the environment?		
Almost never / almost impossible / >20%	1	
Very seldom / highly unlikely / >40%	2	
Infrequent / unlikely / seldom / >60%	3	
Often / regularly / likely / possible / >80%	4	
Daily / highly likely / definitely / >100%	5	
TABLE 6 – LEGAL ISSUES		
How is the activity governed by legislation?		
No legislation	1	
Fully covered by legislation (wetlands are legally governed)	5	
Located within the regulated areas		

TABLE 7 – DETECTION	
How quickly can the impacts/risks of the activity be observed on the environment (water resource)	
Immediately	
Without much effort	
Need some effort	
Remote and difficult to observe	
Covered	

TABLE 8: RATING CLASSES		
RATING	CLASS	MANAGEMENT DESCRIPTION
1 – 55	(L) Low Risk	Acceptable as is or consider requirement for mitigation. Impact to watercourses and resource quality small and easily mitigated. Wetlands may be excluded.
56 – 169	(M) Moderate Risk	Risk and impact on watercourses are notably and require mitigation measures on a higher level, which costs more and
170 – 300	(H) High Risk	Always involves wetlands. Watercourse(s) impacts by the activity are such that they impose a long-term threat on a large scale
A low risk class must be obtained for all activities to be considered for a GA		

TABLE 9: CALCULATIONS

Consequence = Severity + Spatial Scale + Duration
Likelihood=Frequency of Activity + Frequency of Incident +Legal Issues + Detection
Significance \Risk= Consequence X Likelihood

ANNEXURE J: FINAL SCOPING REPORT



PROPOSED NEW TOWNSHIP DEVELOPMENT ON ERF 1, ERF 45, ERF 47, WEGDRAAI, !KHEIS LOCAL MUNICIPALITY, NORTHERN CAPE



SEPTEMBER 2020

!KHEIS LOCAL MUNICIPALITY

**PROPOSED NEW TOWNSHIP DEVELOPMENT ON ERF 1, ERF
45, AND ERF 47, WEGDRAAI, !KHEIS LOCAL MUNICIPALITY,
NORTHERN CAPE**

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ACRONYMS

BGIS	Biodiversity Geographic Information System
CBA	Critical Biodiversity Area
DEA	Department of Environmental Affairs
DENC	Department of Environment and Nature Conservation
DWS	Department of Water and Sanitation
EAP	Environmental Assessment Practitioner
ECA	Environment Conservation Act (Act No. 73 of 1989)
EIA	Environmental Impact Assessment
EIR	Environmental Impact Report
EMP	Environmental Management Programme
HIA	Heritage Impact Assessment
I&APs	Interested and Affected Parties
NEMA	National Environmental Management Act (Act No. 107 of 1998)
NEMBA	National Environmental Management: Biodiversity Act (Act No. 10 of 2004)
NHRA	National Heritage Resources Act (Act No. 25 of 1999)
NID	Notice of Intent to Develop
NWA	National Water Act
OESA	Other Ecological Support Area
SAHRA	South African Heritage Resources Agency
SANBI	South African National Biodiversity Institute
WULA	Water Use Licence Application

1. INTRODUCTION

1.1 BACKGROUND

Consideration is being given to the development of a new township, consisting of approximately 360 erven, including associated infrastructure, on Erven 1, 45, and 47, Wegdraai.

The applicant is !Kheis Local Municipality who will undertake the activity should it be approved. EnviroAfrica CC has been appointed as the independent environmental assessment practitioner (EAP) responsible for undertaking the relevant EIA and the Public Participation Process required in terms of the National Environmental Management Act (Act 107 of 1998) (NEMA).

This Scoping Report, which will be submitted to the Department of Environment and Nature Conservation (DE&NC) for consideration, forms part of the EIA process.

The purpose of this Draft Environmental Scoping Report is to describe the proposed project, the process followed to date, to present alternatives and to list issues identified for further study and comment by specialists.

Should the EIA process be authorised by DE&NC, the Specialist Studies (noted in Section 8) will be undertaken and the significant issues (noted in Section 6) will be investigated and assessed during the next phase of this application.

1.2 DESCRIPTION OF THE PROPOSED ACTIVITY

The !Kheis Local Municipality is proposing that a new township development, consisting of approximately 360 erven and associated infrastructure on Erven 1, 45 and 47, Wegdraai.

The proposed project entails the development of approximately 360 erven with an average including associated infrastructure such as roads, and water, stormwater, effluent and electricity reticulation. The total area to be developed measures 45 hectares.

The site is located approximately 13km north-west of Groblershoop along the N10 in the !Kheis Local Municipality, Northern Cape.

Site co-ordinates: Proposed site: 28° 50' 22.86" S, 21° 51' 52.89" E.

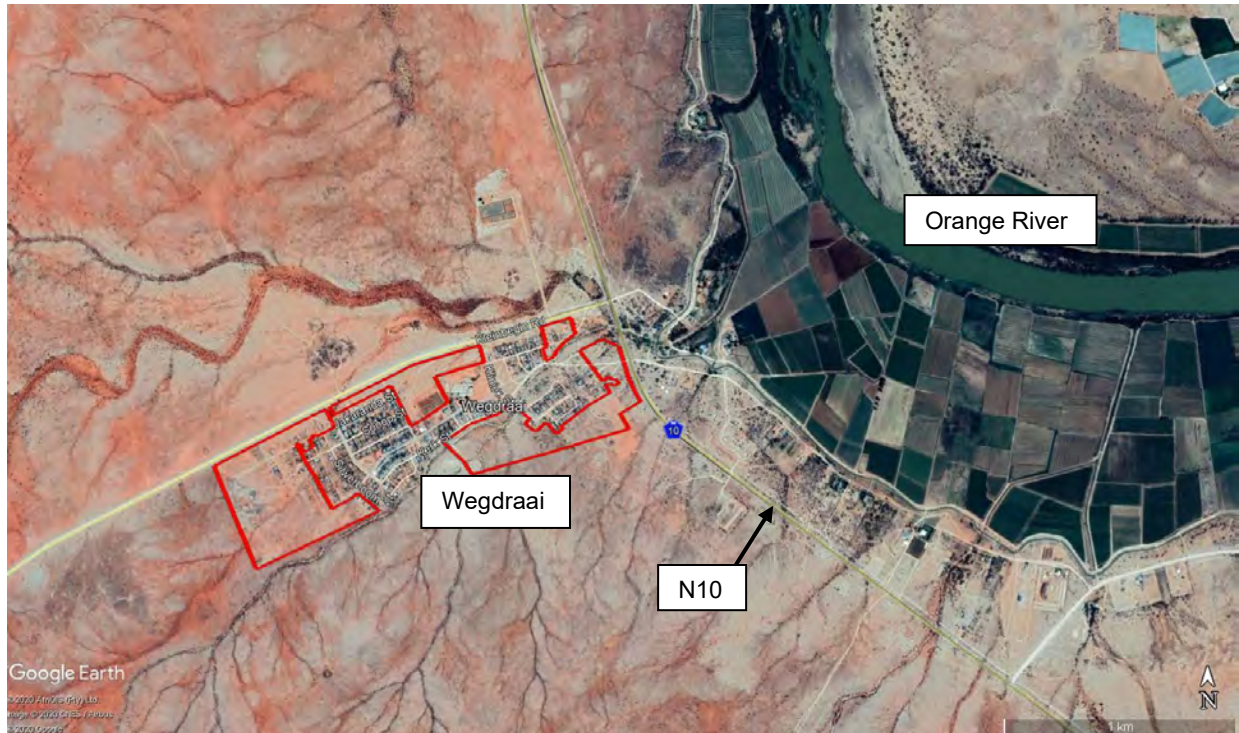


Figure 1. Google Earth image of the site. The proposed site is indicated by the red polygons.

2. NEED AND DESIRABILITY

In terms of the National Environmental Management Act, as amended, EIA 2014 regulations the Scoping/EIA report must provide a description of the need and desirability of the proposed activity. The consideration of “need and desirability” in EIA decision-making requires the consideration of the strategic context of the development proposal along with the broader societal needs and the public interest.

While the concept of need and desirability relates to the *type* of development being proposed, essentially, the concept of need and desirability can be explained in terms of the general meaning of its two components in which *need* refers to *time* and *desirability* to *place* – i.e. is this the right time and is it the right place for locating the type of land-use/activity being proposed? Need and desirability can be equated to *wise use of land* – i.e. the question of what is the most sustainable use of land.

2.1 NEED

Housing is a national need, including in the !Kheis Local Municipality.

The !Kheis Local Municipality's aims to promote socioeconomic development through the eradication of backlogs associated with water and sanitation, electricity, and housing, as well as improve basic services within Topline. In order to meet the needs of the community within Wegdraai, the Council resolved that a project business plan be submitted to Co-operative Governance, Human Settlements and Traditional Affairs (COGHSTA) as well as the construction of 360 erven in Wegdraai over the short to medium term, along with associated infrastructure. As per the !Kheis Integrated Development Plan (IDP) 2019/2020, a key performance indicator includes the provision of infrastructure and basic service through securing suitable land for human settlement projects, where suitable land was previously identified in Boegoeberg, Topline, Wegdraai, Grootdrink, Gariep, and Opwag. The provision of affordable housing units remains a high priority for the Municipality which will restore the dignity of poor people by providing shelter and access to basic human rights as enshrined in the Constitution of South Africa.

The proposed !Kheis housing development falls in line with the !Kheis IDPs key strategic and development objectives of the KLM, to improve and maintain basic service delivery through specific infrastructural projects including human settlements, water, sanitation, electricity, as well as streets and storm water management¹. As per the Land Development Plan/ Rural Spatial Development Framework (2014), Wegdraai is classified as a Low Development Potential/High Human Development Need (Category 3 Investment type = Small-scale Monetary capital, basic services and social capital).

The demographic profile of the KLM includes the total population of 16 637 individuals in 2011 with a total number of 4 145 households. This community requires formalized, state-instituted housing, and associated, infrastructure. The proposed development will distribute the density of the population, improve community member's standard of living, as well as access to essential services including roads, electricity, water supply, appropriate sewage disposal infrastructure, and environmental health in the area. Therefore, the proposed development will enable adequate housing to be constructed, thereby promoting access to basic service delivery as well as socioeconomic development in Wegdraai and its surroundings.

¹ Integrated Development Plan of !Kheis Municipality, 2017-2022 (Review for 2019 – 2020 Financial Year).

The proposed Wegdraai Housing development is in line with the !Kheis IDPs key strategic and development objectives, namely to improve and maintain basic service delivery through specific infrastructural projects including human settlements and basic services, in the poverty-stricken Wegdraai Township. According to the SDF, the population in Wegdraai increased from 1556 (in 2001) to 2189 in 2011 (where 49% of the population are male and 51% female). Therefore, this community requires formalized, state-instituted housing, and associated, infrastructure. The proposed development will distribute the density of the population, improve community member's standard of living, as well as access to essential services including roads, electricity, water supply, appropriate sewage disposal infrastructure, and environmental health in the area. Therefore, the proposed development will enable adequate housing to be constructed, thereby promoting access to basic service delivery as well as socioeconomic development in the Wegdraai Township and its surroundings. !Kheis Local Municipality is committed to the vision of the National Government of which it committed itself towards accelerating shared growth to halve poverty and unemployment and promote social inclusions. Housing is one of the social inclusions in this vision.

The majority of the KLM population is located in five settlements, namely: Grootdrink, Topline, Wegdraai, Groblershoop and Boegoeberg, with the largest of those settlements being Groblershoop, Grootdrink and Wegdraai. With regards to the functional age groups, 60% of KLM's population is of working age (15--64). Grootdrink (40%) and Boegoeberg (40%) have the highest percentages of population aged between 0 and 14, which is decidedly higher than the district percentage of 28%. Education levels and school attendance have increased in KLM. Grootdrink has the lowest percentage individuals with Gr.12 at 9,1%, while Topline has the highest percentage of individuals with 'no schooling' at 17,5%. In comparison Groblershoop has the highest percentage of individuals with Gr.12 (18,5%) and individuals with higher education (1,7%).



Figure 2. Socioeconomic status associated with the proposed Wegdraai Housing Development.

2.2 DESIRABILITY

The following factors determine the desirability of the area for the proposed development.

2.2.1 Location and Accessibility

The proposed location is considered to be a viable option. The proposed site is adjacent to the existing residential area of Wegdraai and the N10, allowing accessibility and linking to the existing services infrastructure. Any upgrades or additional services infrastructure that will be required will be investigated, and included in the Environmental impact Report.

The desirability and location of the proposed development will be further investigated in the Environmental Impact Report, and the town planning motivational report.

2.2.2 Compatibility with the Surrounding Area

The proposed site is adjacent to the existing residential area of Wegdraai. As stated above, this would provide accessibility and allow the proposed development to link to the existing services infrastructure.

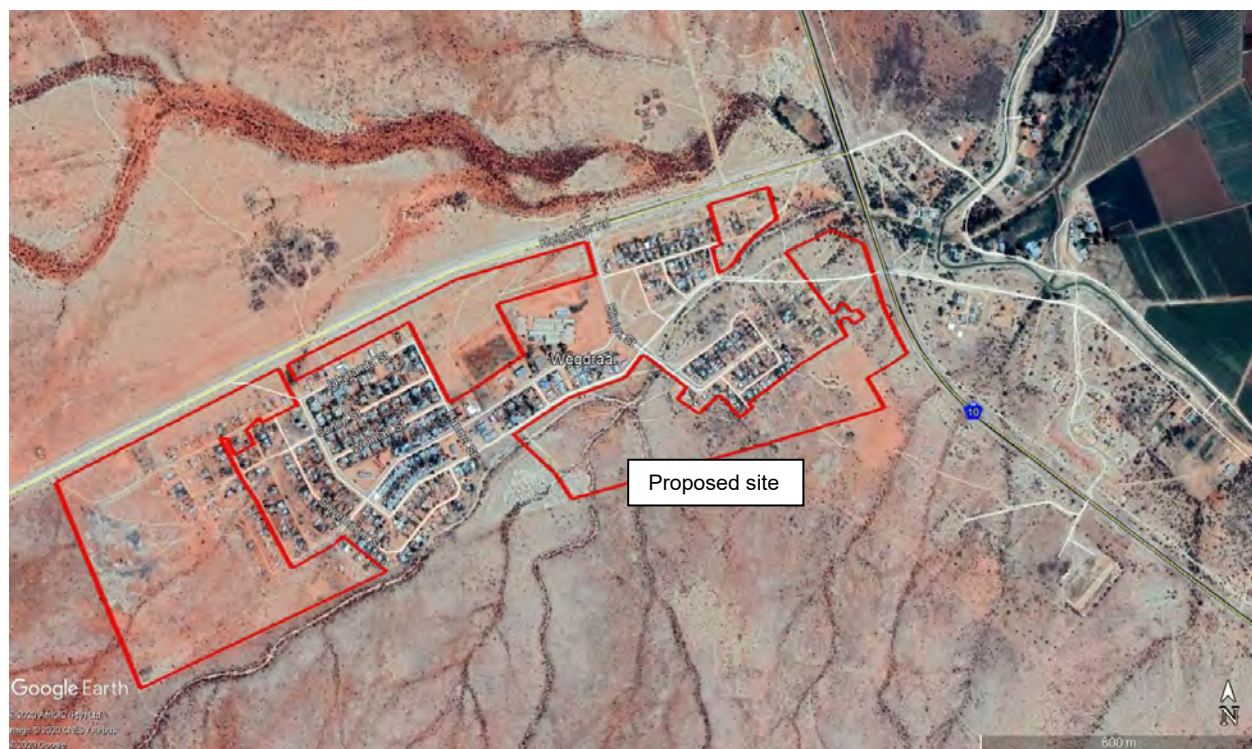


Figure 3: Google Earth image of the surrounding landscape, showing the location of the proposed development in relation with the existing residential areas.

3. LEGAL REQUIREMENTS

The current assessment is being undertaken in terms of the National Environmental Management Act (Act 107 of 1998, NEMA), to be read with section 24 (5): NEMA EIA Regulations 2014. However, the provisions of various other Acts must also be considered within this EIA.

The legislation that is relevant to this study is briefly outlined below.

3.1 THE CONSTITUTION OF THE REPUBLIC OF SOUTH AFRICA

The Constitution of the Republic of South Africa (Act 108 of 1996) states that everyone has a right to a non-threatening environment and that reasonable measures are applied to protect the environment. This includes preventing pollution and promoting conservation and environmentally sustainable development, while promoting justifiable social and economic development.

3.2 NATIONAL ENVIRONMENTAL MANAGEMENT ACT (ACT 107 OF 1998)

The National Environmental Management Act (Act 107 of 1998) (NEMA), as amended, makes provision for the identification and assessment of activities that are potentially detrimental to the environment and which require authorisation from the relevant authorities based on the findings of an environmental assessment. NEMA is a national act, which is enforced by the Department of Environmental Affairs (DEA). These powers are delegated in the Northern Cape to the Department of Environment and Nature Conservation (DE&NC).

On the 04 December 2014 the Minister of Water and Environmental Affairs promulgated regulations in terms of Chapter 5 of the NEMA, namely the EIA Regulations 2014. These were amended on 07 April 2017 (GN No. 326, No. 327 (Listing Notice 1), No. 325 (Listing Notice 2), No. 324 (Listing Notice 3) in Government Gazette No. 40772 of 07 April 2017). Listing Notice 1 and 3 are for a Basic Assessment and Listing Notice 2 for a full Environmental Impact Assessment.

According to the regulations of Section 24(5) of NEMA, authorisation is required for the following listed activities for the proposed agricultural development:

Government Notice R327 (Listing Notice 1) listed activities:

- 12** The development of;
- (i) dams or weirs, where the dam or weir, including infrastructure and water surface area, exceeds 100 square metres;
 - (ii) infrastructure or structures with a physical footprint of 100 square metres or more;
- where such development occurs;
- (a) within a watercourse;
 - (b) in front of a development setback; or
 - (c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse;

- 19** The infilling or depositing of any material of more than 10 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 10 cubic metres from a watercourse;
- (a) will occur behind a development setback;
 - (b) is for maintenance purposes undertaken in accordance with a maintenance management plan; or
 - (c) falls within the ambit of activity 21 in this Notice, in which case that activity applies.
- 24** The development of a road;
- (i) for which an environmental authorisation was obtained for the route determination in terms of activity 5 in Government Notice 387 of 2006 or activity 18 in Government Notice 545 of 2010; or
 - (ii) with a reserve wider than 13,5 meters, or where no reserve exists where the road is wider than 8 metres;
- but excluding a road;
- (a) which is identified and included in activity 27 in Listing Notice 2 of 2014; or
 - (b) where the entire road falls within an urban area; or
 - (c) which is 1 kilometre or shorter
- 27** The clearance of an area of 1 hectares or more, but less than 20 hectares of indigenous vegetation, except where such clearance of indigenous vegetation is required for;
- (i) the undertaking of a linear activity; or
 - (ii) maintenance purposes undertaken in accordance with a maintenance management plan.
- 56** The widening of a road by more than 6 metres, or the lengthening of a road by more than 1 kilometre;
- (i) where the existing reserve is wider than 13,5 meters; or
 - (ii) where no reserve exists, where the existing road is wider than 8 metres;
- excluding where widening or lengthening occur inside urban areas.

Government Notice R325 (Listing notice 2) listed activities:

- 15** The clearance of an area of 20 hectares or more of indigenous vegetation, excluding where such clearance of indigenous vegetation is required for;
- (i) the undertaking of a linear activity; or
 - (ii) maintenance purposes undertaken in accordance with a maintenance management plan.

Government Notice R324 (Listing notice 3) listed activities:

- 4** The development of a road wider than 4 metres with a reserve less than 13.5 metres
- 12** The clearance of an area of 300 square metres or more of indigenous vegetation except where such clearance of vegetation is required for maintenance purposes undertaken in accordance with a maintenance management plan.

- 14** The development of;
- (i) dams or weirs, where the dam or weir, including infrastructure and water surface area, exceeds 10 square metres;
 - (ii) infrastructure or structures with a physical footprint of 10 square metres or more;
- where such development occurs;
- (a) within a watercourse;
 - (b) in front of a development setback; or
 - (c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse;
- Excluding the development of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour;

An Application Form will be submitted to DE&NC. On acknowledgment from DE&NC this Scoping Process is being undertaken to identify potential issues.

The principles of environmental management as set out in section 2 of NEMA have been taken into account. The principles pertinent to this activity include:

- People and their needs will be placed at the forefront while serving their physical, psychological, developmental, cultural and social interests. The activity seeks to provide additional employment and economic development opportunities, which are a local and national need – *the proposed activity is expected to have a beneficial impact on people, especially developmental and social benefits, as well providing additional employment and economic development opportunities.*
- Development will be socially, environmentally and economically sustainable. Where disturbance of ecosystems, loss of biodiversity, pollution and degradation, and landscapes and sites that constitute the nation's cultural heritage cannot be avoided, are minimised and remedied. The impact that the activity will potentially have on these will be considered, and mitigation measures will be put in place - *potential impacts have been identified and considered, and any further potential impacts will be identified during the public participation process. Mitigation measures will be included in the EMP.*
- Where waste cannot be avoided, it will be minimised and remedied through the implementation and adherence of the Environmental Management Programme (EMP) – *this will be included in the EIR.*
- The use of non-renewable natural resources will be responsible and equitable.
- The negative impacts on the environment and on people's environmental rights will be anticipated, investigated and prevented, and where they cannot be prevented, will be minimised and remedied.
- The interests, needs and values of all interested and affected parties will be taken into account in any decisions through the Public Participation Process.
- The social, economic and environmental impacts of the activity will be considered, assessed and evaluated, including the disadvantages and benefits.
- The effects of decisions on all aspects of the environment and all people in the environment will be taken into account, by pursuing what is considered the best practicable environmental option.

3.3 NATIONAL HERITAGE RESOURCES ACT

The protection and management of South Africa's heritage resources are controlled by the National Heritage Resources Act (Act No. 25 of 1999). South African National Heritage Resources Agency (SAHRA) is the enforcing authority.

In terms of Section 38 of the National Heritage Resources Act, SAHRA will require a Heritage Impact Assessment (HIA) where certain categories of development are proposed. Section 38(8) also makes provision for the assessment of heritage impacts as part of an EIA process and indicates that if such an assessment is found to be adequate, a separate HIA is not required.

The National Heritage Resources Act requires relevant authorities to be notified regarding this proposed development, as the following activities are relevant:

- *any development or other activity which will change the character of a site exceeding 5 000 m² in extent;*
- *the construction of a road, wall, powerline, pipeline, canal or other similar form of linear development or barrier exceeding 300m in length*

Furthermore, in terms of Section 34(1), no person may alter or demolish any structure or part of a structure, which is older than 60 years without a permit issued by the SAHRA, or the responsible resources authority. Nor may anyone destroy, damage, alter, exhume or remove from its original position, or otherwise disturb, any grave or burial ground older than 60 years, which is situated outside a formal cemetery administered by a local authority, without a permit issued by the SAHRA, or a provincial heritage authority, in terms of Section 36 (3). In terms of Section 35 (4), no person may destroy, damage, excavate, alter or remove from its original position, or collect, any archaeological material or object, without a permit issued by the SAHRA, or the responsible resources authority.

3.4 EIA GUIDELINE AND INFORMATION DOCUMENT SERIES

The following are the latest guidelines and information Documents that have been consulted:

- Department of Environmental Affairs and Development Planning's (DEA&DP) *Environmental Impact Assessment Guideline and Information Document Series (Dated: March 2013)*:
 - ✓ *Guideline on Transitional Arrangements*
 - ✓ *Generic Terms of Reference for EAPs and Project Schedules*
 - ✓ *Guideline on Alternatives*
 - ✓ *Guideline on Public Participation*
 - ✓ *Guideline on Exemption Applications*
 - ✓ *Guideline on Appeals*
 - ✓ *Guideline on Need and Desirability*
- Department of Environmental Affairs and Tourism (DEAT) *Integrated Environmental Management Information Series*

3.5 NATIONAL WATER ACT

Besides the provisions of NEMA for this EIA process, the proposed development may also require authorizations under the National Water Act (Act N0. 36 of 1998). The Department of Water and Sanitation, who administer that Act, will be a leading role-player in the EIA.

If, and as required by the Department of Water and Sanitation, a Water Use Licence Application (WULA) may be compiled and submitted.

3.6 NATIONAL ENVIRONMENTAL MANAGEMENT: BIODIVERSITY ACT

The National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) (NEMBA) is part of a suite of legislation falling under NEMA, which includes the Protected Areas Act, the Air Quality Act, the Integrated Coastal Management Act and the Waste Act. Chapter 4 of NEMBA deals with threatened and protected ecosystems and species and related threatened processes and restricted activities. The need to protect listed ecosystems is addressed (*Section 54*).

3.7 NATIONAL FORESTS ACT

The National Forests Act, 1998 (Act 84 of 1998) (NFA) makes provisions for the management and conservation of public forests.

In terms of section 15(1) of the National Forests Act, 1998, no person may

- (a) cut, disturb, damage or destroy any protected tree; or
- (b) possess, collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree, or any forest product derived from a protected tree, except
 - (i) under a license granted by the Minister; or
 - (ii) in terms of an exemption from the provisions of this subsection published by the Minister in the Gazette.

3.8 NORTHERN CAPE CONSERVATION ACT, ACT 09 OF 2009

On the 12th of December 2011, the new Northern Cape Nature Conservation Act 9 of 2009 (NCNCA) came into effect, which provides for the sustainable utilization of wild animals, aquatic biota and plants. Schedule 1 and 2 of the Act give extensive lists of specially protected and protected fauna and flora species in accordance with this act. The NCNCA is a very important Act in that it put a whole new emphasis on a number of species not previously protected in terms of legislation.

It also put a new emphasis on the importance of species, even within vegetation classified as “Least Threatened” (in accordance with GN 1002 of 9 December 2001, promulgated in terms of the National Environmental Management Biodiversity Act 10 of 2004). Thus, even though a project may be located within a vegetation type or habitat previously not considered under immediate threat, special care must still be taken to ensure that listed species (fauna & flora) are managed correctly.

3.9 THE SPATIAL PLANNING AND LAND USE MANAGEMENT ACT (ACT 16 OF 2013)

The subject area falls under the jurisdiction of the local municipality and the appropriate zoning and subdivision would need to be allocated in order to permit the development of the land for the intended purpose.

4. ALTERNATIVES

Alternatives to the proposed development are very limited and have therefore not been considered for the following reasons described below.

4.1 SITE ALTERNATIVES

The proposed site is the only viable site available at this stage and the only one that will be investigated in this application. Housing is a constant need in the municipality, with other sites possibly earmarked for residential development that will not form part of this application. These will be addressed in the Environmental Impact Report.

4.2 ACTIVITY ALTERNATIVES

Activity alternatives are also very limited with no feasible alternatives besides residential development to assess. Due to the need for housing in the !Kheis Local Municipality, the housing development and associated infrastructure on the property is therefore the only activity considered.

The development may include a number of different land-uses however, besides just residential opportunities, to be incorporated into the layout. These will be investigated during the Environmental Impact Report phase.

4.3 LAYOUT ALTERNATIVES

Various layout alternatives will be investigated during the Environmental Impact Report. These will be compiled with input from the municipality and its requirements, as well as input and/or recommendations of the various specialists, as well as input from Interested and Affected Parties, including the community

4.4 NO-GO ALTERNATIVE

This is the option of not developing the proposed residential development.

Although the no-go development might result in no potential negative environmental impacts, the direct and indirect socio-economic benefits of not constructing the residential development will not be realised. The need for additional housing opportunities in the !Kheis Local Municipality will not be realised. These potential negative and/or positive environmental impacts will be assessed in the Environmental Impact Report.

5. SITE DESCRIPTION

5.1 LOCATION

The proposed site is located in Wegdraai, to the west of the N10. Wegdraai is located approximately 13km north-west of Groblershoop along the N10 in the !Kheis Local Municipality, Northern Cape.

Site co-ordinates: Proposed site: 28° 50' 22.86" S, 21° 51' 52.89" E.

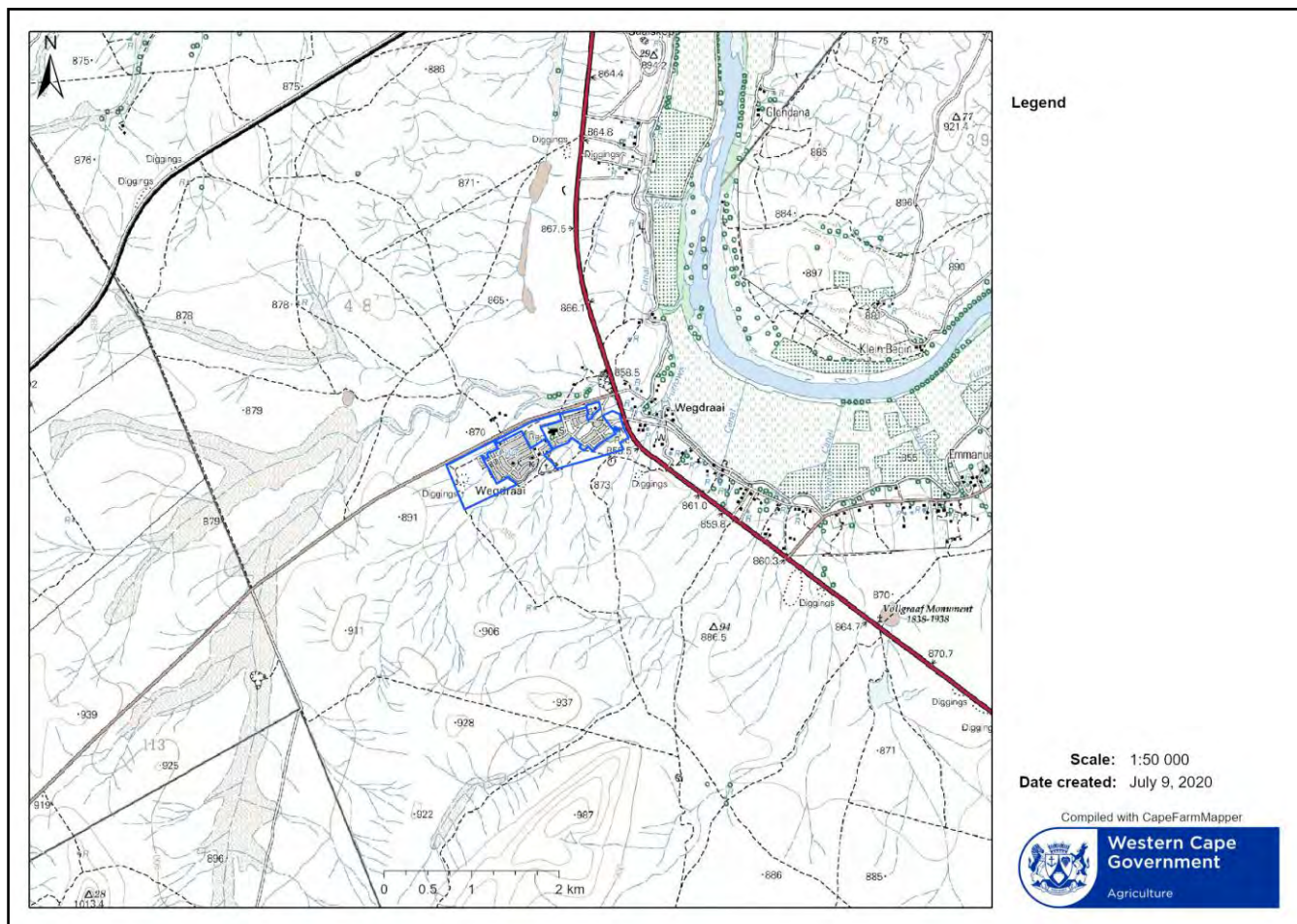


Figure 4: Locality map (1: 50 000) showing the locality of the site.

5.2 VEGETATION

The proposed site of the residential development is generally undeveloped, fallow and generally near natural. The edges of the site, especially adjacent to the existing residential areas, are disturbed.

According to the Vegetation map of South Africa, Lesotho and Swaziland (Mucina & Rutherford, 2006, as updated in the 2012 beta version) only one broad vegetation type is expected on the proposed site, namely Bushmanland Arid Grassland.

Lower Gariep Alluvial Vegetation is identified on SANBI BGIS to the east of the site (Orange River).

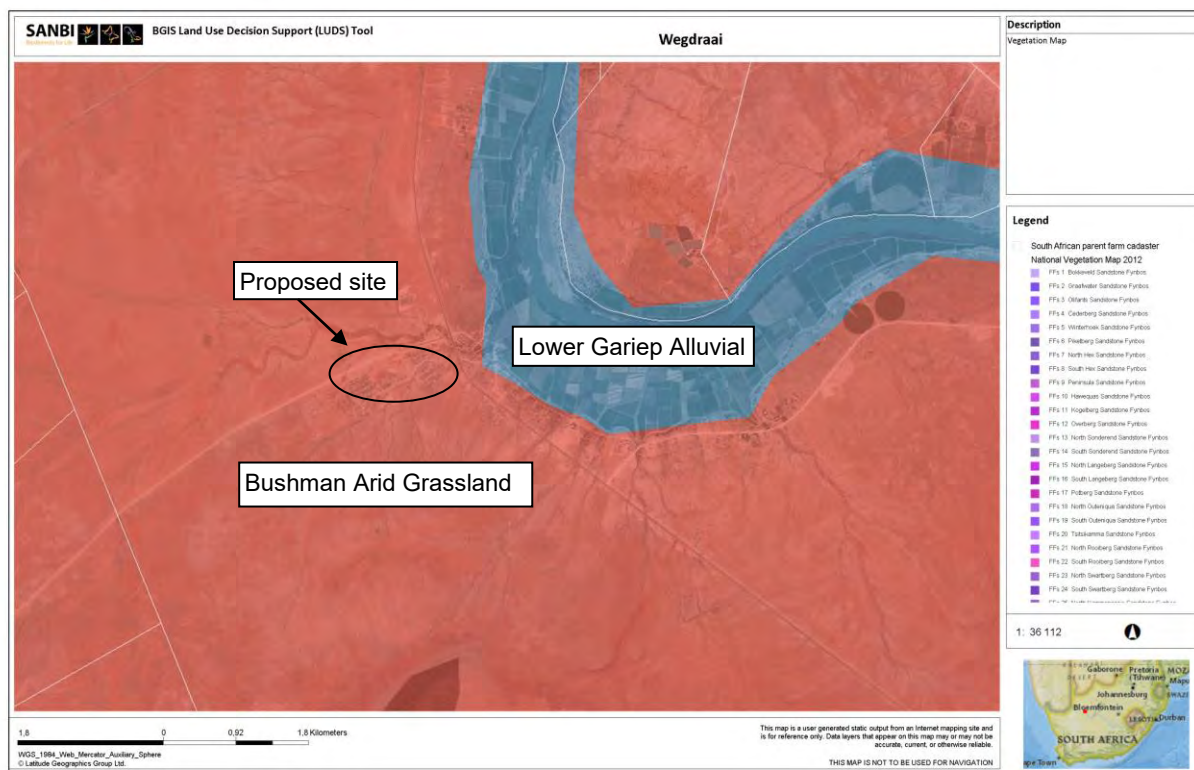


Figure 5: SANBI Vegetation map of the area. Source: BGIS.

According to the Northern Cape Critical Biodiversity Areas (CBA) maps the proposed site falls within a CBA area (Figure 6). However, there is no alternative on Municipal land that will not impact on the CBA. The 2016, Northern Cape CBA Map (Figure 6) identifies biodiversity priority areas, called Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs), which, together with protected areas, are important for the persistence of a viable representative sample of all ecosystem types and species as well as the long-term ecological functioning of the landscape as a whole (Holness & Oosthuysen, 2016). The 2016 Northern Cape Critical Biodiversity Area (CBA) Map updates, revises and replaces all older systematic biodiversity plans and associated products for the province (including the Namakwa District Biodiversity Sector Plan, 2008). Priorities from existing plans such as the Namakwa District Biodiversity Plan, the Succulent Karoo Ecosystem Plan, National Estuary Priorities, and the National Freshwater Ecosystem Priority Areas were incorporated. Targets for terrestrial ecosystems were based on established national targets, while targets used for other features were aligned with those used in other provincial planning processes.

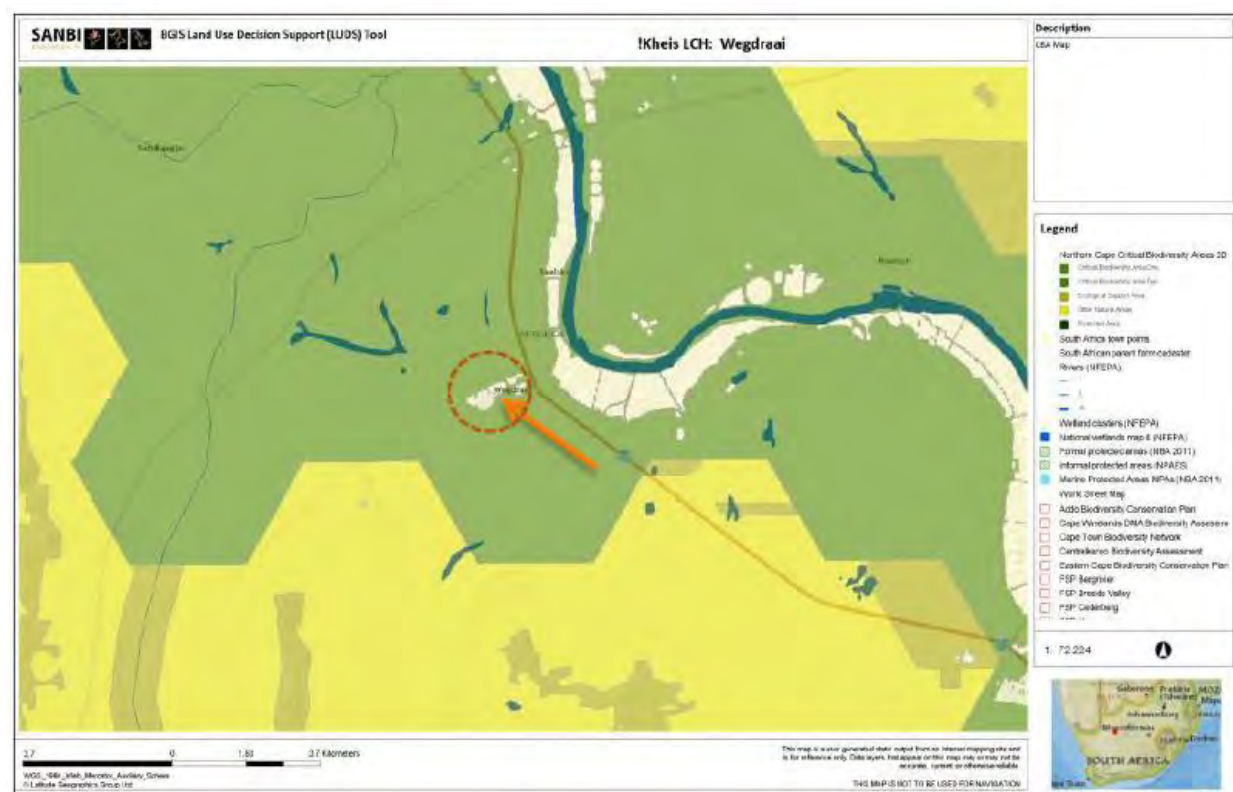


Figure 6: CBA associated with the proposed Wegdraai site for development. Source: BGIS.

5.3 FRESHWATER

From the SANBI National Freshwater Ecosystem Priority Areas map (see Figure 7 below), there are no natural watercourses identified on the site on the NFEPA overlay. However, from the Google Earth images, there appears to be a number of ephemeral streams adjacent to, and within, the site.

The source and nature of these possible ephemeral streams is to be investigated during the Scoping Phase, and if these are determined to be natural watercourses/wetlands, the impact of the proposed development on these watercourses are to be investigated in the Environmental Impact Report.

The Orange River is also located approximately 1km north-east of the site. Any direct or indirect impacts on the Orange River will also be investigated in the Environmental Impact Report.

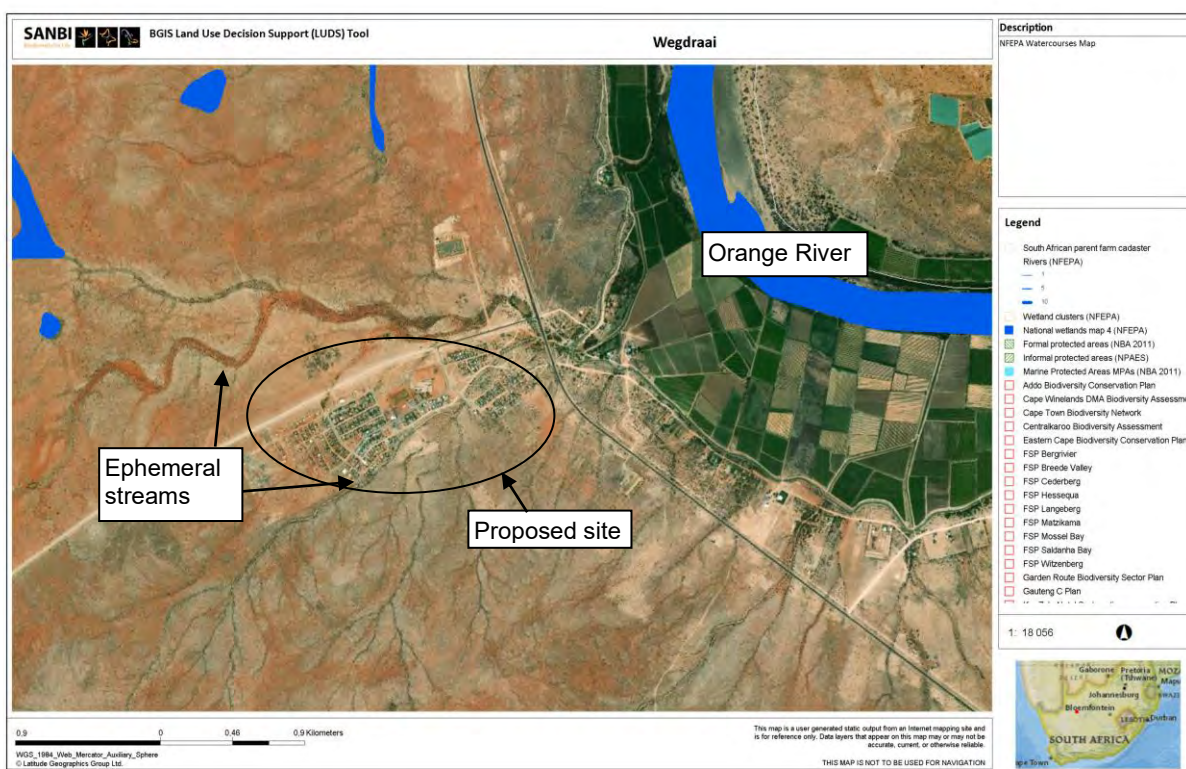


Figure 7: SANBI NFEPA map of the area.

5.4 CLIMATE

Climate data for Upington will be used, the nearest town (approximately 80km from Wegdraai) with reliable data. The Upington area is regarded as an arid area (regions with a rainfall of less than 400 mm per year are regarded as arid). This area normally receives about 180 mm of rain per year, with rainfall largely in summer. It receives the least amount of rain in winter (July), and the most amount during March.

The average annual temperature is 19.3°C, with an average of 26.2°C in January, and 11.5°C in July.

5.5 SOCIO-ECONOMIC CONTEXT

The !Kheis Local Municipality's aims to promote socioeconomic development through the eradication of backlogs associated with water and sanitation, electricity, and housing, as well as improve basic services within Topline. In order to meet the needs of the community within Wegdraai, the Council resolved that a project business plan be submitted to Co-operative Governance, Human Settlements and Traditional Affairs (COGHSTA) as well as the construction of 360 erven in Wegdraai over the short to medium term, along with associated infrastructure. As per the !Kheis Integrated Development Plan (IDP) 2019/2020, a key performance indicator includes the provision of infrastructure and basic service through securing suitable land for human settlement projects, where suitable land was previously identified in Boegoeberg, Topline, Wegdraai, Grootdrink, Gariep, and Opwag. The provision of affordable housing units remains a

high priority for the Municipality which will restore the dignity of poor people by providing shelter and access to basic human rights as enshrined in the Constitution of South Africa.

The proposed !Kheis housing development falls in line with the !Kheis IDPs key strategic and development objectives of the KLM, to improve and maintain basic service delivery through specific infrastructural projects including human settlements, water, sanitation, electricity, as well as streets and storm water management². As per the Land Development Plan/ Rural Spatial Development Framework (2014), Wegdraai is classified as a Low Development Potential/High Human Development Need (Category 3 Investment type = Small-scale Monetary capital, basic services and social capital).

The demographic profile of the KLM includes the total population of 16 637 individuals in 2011 with a total number of 4 145 households. This community requires formalized, state-instituted housing, and associated, infrastructure. The proposed development will distribute the density of the population, improve community member's standard of living, as well as access to essential services including roads, electricity, water supply, appropriate sewage disposal infrastructure, and environmental health in the area. Therefore, the proposed development will enable adequate housing to be constructed, thereby promoting access to basic service delivery as well as socioeconomic development in Wegdraai and its surroundings.

The proposed Wegdraai Housing development is in line with the !Kheis IDPs key strategic and development objectives, namely to improve and maintain basic service delivery through specific infrastructural projects including human settlements and basic services, in the poverty-stricken Wegdraai Township. According to the SDF, the population in Wegdraai increased from 1556 (in 2001) to 2189 in 2011 (where 49% of the population are male and 51% female). Therefore, this community requires formalized, state-instituted housing, and associated, infrastructure. The proposed development will distribute the density of the population, improve community member's standard of living, as well as access to essential services including roads, electricity, water supply, appropriate sewage disposal infrastructure, and environmental health in the area. Therefore, the proposed development will enable adequate housing to be constructed, thereby promoting access to basic service delivery as well as socioeconomic development in the Wegdraai Township and its surroundings. !Kheis Local Municipality is committed to the vision of the National Government of which it committed itself towards accelerating shared growth to halve poverty and unemployment and promote social inclusions. Housing is one of the social inclusions in this vision.

The majority of the KLM population is located in five settlements, namely: Grootdrink, Topline, Wegdraai, Groblershoop and Boegoeberg, with the largest of those settlements being Groblershoop, Grootdrink and Wegdraai. With regards to the functional age groups, 60% of KLM's population is of working age (15--64). Grootdrink (40%) and Boegoeberg (40%) have the highest percentages of population aged between 0 and 14, which is decidedly higher than the district percentage of 28%. Education levels and school attendance have increased in KLM. Grootdrink has the lowest percentage individuals with Gr.12 at 9,1%, while Topline has the highest percentage of individuals with 'no schooling' at 17,5%. In comparison Groblershoop has the highest percentage of individuals with Gr.12 (18,5%) and individuals with higher education (1,7%).

² Integrated Development Plan of !Kheis Municipality, 2017-2022 (Review for 2019 – 2020 Financial Year).

5.6 HERITAGE FEATURES

Due to the nature and size of the proposed development, potential heritage resources may be affected by the development. Heritage resources include any of the following, as defined by the National Heritage Resources Act (Act 25 of 1999):

- living heritage as defined in the National Heritage Council Act No 11 of 1999 (cultural tradition; oral history; performance; ritual; popular memory; skills and techniques; indigenous knowledge systems; and the holistic approach to nature, society and social relationships);
- Ecofacts (non-artefactual organic or environmental remains that may reveal aspects of past human activity; definition used in KwaZulu-Natal Heritage Act 2008);
- places, buildings, structures and equipment;
- places to which oral traditions are attached or which are associated with living heritage;
- historical settlements and townscapes;
- landscapes and natural features;
- geological sites of scientific or cultural importance;
- archaeological and palaeontological sites;
- graves and burial grounds;
- public monuments and memorials;
- sites of significance relating to the history of slavery in South Africa;
- movable objects, but excluding any object made by a living person; and
- battlefields.

6. SERVICES

Due to the scale of the development, the availability of bulk services for the development will need to be investigated. The !Kheis Local Municipality will more than likely be the service provider for the bulk services.

BVi Engineers will prepare the Bulk Engineering Services Reports on the external services for the proposed development.

6.1 WATER

The water source, upgrades to existing water reticulation infrastructure and connection with the proposed internal water network will need to be determined. Back-up storage will also need to be investigated.

The availability and confirmation that sufficient capacity exists to service the proposed development will need to be addressed, and confirmation received from the engineers and/or municipality.

6.2 SEWER

The availability of sewer services, the potential upgrades to existing infrastructure or the potential development of new infrastructure to adequately service the proposed development will need to be investigated.

The availability and confirmation that sufficient capacity exists to service the proposed development will need to be addressed and confirmed by the engineers and/or the municipality.

6.3 ROADS

The internal road network and design standards, including any access roads, will need to be determined in line with the proposed layout design. The main entrance to the development is expected to be from the N10 to the east and Kleinbegin Rd to the north.

A Traffic Impact Assessment will be conducted to determine the design of the internal roads, including any upgrades that will be required to existing roads to provide adequate access to the site, or if new access points will be needed.

6.4 STORMWATER

The internal stormwater network and links and upgrades to the existing external stormwater network, will need to be determined and addressed in the Bulk Engineering Services Reports. This will be determined once a conceptual site layout plan has been developed.

6.5 SOLID WASTE (REFUSE) REMOVAL

Refuse removal will be via the Municipal waste stream and disposed of at the nearest municipal bulk solid waste disposal site. Sufficient capacity to adequately service the proposed development will need to be confirmed by the engineers and municipality.

6.6 ELECTRICITY

The proposed internal electrical network, electrical infrastructure requirements, upgrades to the existing external electrical network, including the provider and confirmation of sufficient capacity will need to be determined and addressed in the Bulk Engineering Services Reports.

7. ENVIRONMENTAL ISSUES AND POTENTIAL IMPACTS

Environmental issues were raised through informal discussions with the project team, specialists and authorities. All issues raised will be assessed in the specialist reports and will form part of the Environmental Impact Report. Additional issues raised during the public participation will be listed in the Final Scoping Report.

The following potential issues have been identified:

7.1 BOTANICAL

A botanical impact assessment will be conducted to determine if there is any sensitive or endangered vegetation on the proposed site. Due to the size of the development (approximately 45ha), there will be a loss of vegetation during the construction phase of the project.

A Botanical Impact Assessment will be conducted, which will describe and assess the botanical sensitivity of the area. The terms of reference for this study required a baseline analysis of the flora of the property, including the broad ecological characteristics of the site.

The botanical assessment will include the following:

- The significance of the potential impact of the proposed project, alternatives and related activities – with and without mitigation – on biodiversity pattern and process at the site, landscape and regional scales.
- Recommended actions that should be taken to prevent or, if prevention is not feasible, to mitigate impacts.

7.2 FRESHWATER

Freshwater ecosystems were identified on desktop analysis, and due to the size and nature of the development and the unknown source of standing water within the development site, a freshwater impact assessment will be conducted. Any potential impacts to the Orange River will also be investigated.

The terms of reference for the Freshwater assessment are as follows:

- Literature review and assessment of existing information
- Site Assessment of the proposed activities and impact on the associated freshwater systems. This will include an assessment of the freshwater ecological condition, using river health indices such as in-stream and riparian habitat integrity, aquatic macro-invertebrates and riparian vegetation to determine set back lines and geomorphological condition of the streams, which will then determine the overall Ecostatus of the streams and provide data that will inform the Water Use Licence Application of the project.
- Describe ecological characteristics of freshwater systems and compile report based on the data and information collected in the previous two tasks, describe ecological characteristics of the freshwater systems, comment on the conservation value and importance of the freshwater systems and delineate the outer boundary of the riparian zones/riverine corridors.
- Evaluate the freshwater issues on the site and propose mitigation measures and measures for the rehabilitation of the site as well as setback lines for future development.

- Compilation of the documentation for submission of the water use authorisation application (WULA) to the Department of Water and Sanitation (if deemed necessary).

7.3 HERITAGE

The possible impact on heritage resources has been identified as a possible environmental impact as a result of the development.

A Heritage Impact Assessment will be conducted on the site.

The terms of reference for the heritage and archaeological study are as follows:

- To determine whether there are likely to be any important archaeological sites or remains that might be impacted by the proposed development;
- To identify and map archaeological sites/remains that might be impacted by the proposed development;
- To assess the sensitivity and conservation significance of archaeological sites/remains in the inundation area;
- To assess the status and significance of any impacts resulting from the proposed development, and
- To identify measures to protect any valuable archaeological sites/remains that may exist within the estimated inundation area.

7.4 VISUAL IMPACT

The potential impact on the sense of place of the proposed development will also be considered. However, due to the nature of the activity, the surrounding land-uses, and that the sense of place is not expected to be significantly altered by the proposed development, no further studies are suggested.

7.5 OTHER ISSUES IDENTIFIED

Any further issues raised during the public participation process or by the Competent Authority not mentioned in this section, will be dealt with during the EIA phase.

8. DETAILS OF THE PUBLIC PARTICIPATION PROCESS

Potential Interested and Affected Parties (I&APs) have been and will be identified throughout the process. Landowners adjacent to the proposed site, relevant organs of state, organizations, ward councillors and the Local and District Municipality were added to this database. A complete list of organisations and individual groups identified to date is shown in **Appendix 1**.

Public Participation will be conducted for the proposed development in accordance with the requirements outlined in Regulation 41 of the NEMA EIA Regulations 2014. The issues and concerns raised during the scoping phase will be dealt with in the EIA phase of this application.

As such each subsection of Regulation 41 contained in Chapter 6 of the NEMA EIA Regulations 2014 will be addressed separately to thereby demonstrate that all potential Interested and Affected Parties (I&AP's) were notified of the proposed development.

R54 (2) (a):

R41 (2) (a) (i): The site notices (A2 and A3 sizes) were placed at different locations around the project site as well as at the municipality office in town.

The posters contained all details as prescribed by R41(3) (a) & (b) and the size of the on-site poster was at least 60cm by 42cm as prescribed by section R41 (4) (a).

R41 (2) (a) (ii): N/A. There is no alternative site.

R41 (2) b):

R41 (2) (b) (i): N/A. The Applicant is the landowner

R41 (2) (b) (ii): Notification letters will be circulated to residents adjacent to/within close proximity of the project site. **Appendix 1C**

R41 (2) (b) (iii): An initial notification letter will be sent to the municipal Ward councillor at the !Kheis Local Municipality, for the ward in which the site is situated.

R41 (2) (b) (iv): No notification letter will be sent to the !Kheis Local Municipality as the municipality is the Applicant

R54 (2) (b) (v): The Draft Scoping Report and notification letters will be sent to the following organs of state having jurisdiction in respect of any aspect of the activity:

- Department of Water and Sanitation
- Department of Agriculture and Land Reform
- Department of Roads and Public Works
- Department of Agriculture, Forestry and Fisheries
- Department of Cooperative Governance, Human Settlements and Traditional Affairs
- SANRAL
- Department of Environment and Nature Conservation

- South African Heritage Resources Agency

R41 (2) (c) (i): An advertisement was placed in the local newspaper.

R41 (2) (d): N/A

R41 (6):

R41 (6) (a): All relevant facts in respect of the application were made available to potential I&AP's.

R41 (6) (b): I&AP's will be given more than 30-days to register and/or comment on the Draft Scoping Report.

R42 (a), (b), (c) and R43(2): A register of interested and affected parties was opened, maintained and is available to any person requesting access to the register in writing.

Please find attached in **Appendix 1**:

- Proof of Notice boards, advertisements and notices that were sent out
- List of potential interested and affected parties
- Summary of issues raised by interested and affected parties

9. PLAN OF STUDY FOR THE EIA

9.1.1 TASKS TO BE UNDERTAKEN

Due to the nature of the proposed development there are a number of activities that will still need to be undertaken during the next phase of the project. The proposed process is as described as follows (This follows from a Scoping process to be accepted by the D:E&NC):

The NEMA Application Form will be submitted to D:E&NC along with the Draft Scoping Report which will be available for a 60-day comment period starting from the **3rd August 2020 to 7th October 2020**. Comments received during the Public Participation Process will be incorporated into the Final Scoping Report, to be submitted to D:E&NC for a decision.

The following is a list of tasks to be performed as part of the EIA Process. Should the process be modified significantly, changes will be copied to D:E&NC.

Table 1. Detailed Project Plan as per NEMA Scoping and EIA Regulations 2014 (as amended): !Kheis Housing Development: Wegdraai Housing

No.	Action	Timeline
1	Clarification meeting with client and appointment of environmental assessment practitioner (EAP) for EIA and environmental authorisation (EA) application	17 th April 2020
2	Appointment of specialists for EIR assessments	7 th May 2020
	Botanical Specialist	
	Freshwater Specialist	
	Archaeological Specialist	
3	Draft Scoping Report compilation	10-14 th May 2020
4	EAP site visit	19 th May 2020
5	Public participation (PP): <ul style="list-style-type: none"> - Letter drops (Adjacent Landowner Notification); - Poster placement (Public notice board at the !Kheis Local Municipality, public notice board of AgriMark (Groblershoop), local Clinic, different conspicuous locations along the boundary of the proposed site for development (with a lot of foot traffic), and three tuckshops/ stores. - Advertisement publication (<i>published on 11th June 2020</i>) PP comment period must be a minimum of 60 days ³	19 th May 2020
6	Specialist site visits	18-22 nd May 2020
	Botanical Assessment (Mr Peet Botes)	18-22 nd May 2020
	Freshwater Assessment (Dr Dirk Van Driel)	18-22 nd May 2020
	Archaeological Assessment (Mr Jan Engelbrecht)	18-31 st May 2020
7	Advert comment period ends (<i>60-day comment period as per new directions</i>)	14 th August 2020
Application and Scoping Phase		
8	Application Form Compilation and Submission (Competent Authority have 10 days to	7 days

³As per section 4 of the 'Directions Regarding Measures to Address, Prevent and Combat the Spread of COVID-19 Relating to National Environmental Management Permits and Licenses', published on the 5th June 2020 by the Department of Environment, Forestry and Fisheries (DEFF). These new directions state that any notice given after the 5th June 2020 requires an extended 30-day comment period in addition to the legislated 30-day comment period (total of 60-day comment period). If PP was conducted before the 27th March 2020, the formal comment period between 27th March and 5th June 2020 are null and void and therefore, restarted on the 6th June 2020. The initial comment period must be extended by additional 21 days (total of 51 day). Please note that we are still waiting for directives from DEFF on application timelines. These Directives published on the 5th June 2020 apply to Level 3 Lockdown Period and are subject to change. Please note: the dates above may be subject to change should the Department of Environmental Affairs, Forestry and Fisheries (DEFF) and the Department of Environment and Nature Conservation (DENC) issue any new directives and legislated timeframes. The final decision (No. 18) may be expedited on request by the applicant.

	respond)	
9	EAP to compile the draft Scoping Report (SR) (incl. the Plan of Study for EIA) and submit with Application Form	
10	If in order, the Department to acknowledge the application.	10 days
11	EAP to notify I&APs (incl. the State departments) EAP to notify the registered I&APs (incl. the State departments) of the availability of the draft SR.	7 days
12	Commenting period of 30 days + 30days for I&APs and State departments to comment.	60 days
13	EAP to consider the comments received and complete the final SR.	3 days
14	Following the commenting period the EAP to submit the Final SR together with any comments received on the final SR to the Department (within 74 days of submission of the Application Form)	7 days
15	Department to acknowledge SR & Plan of Study for EIA.	10 days
16	If in order, the Department to accept the SR & Plan of Study for EIA (within 43 days + 30 days of receipt of Final SR)	73 days
Application and Scoping Phase		
17	EAP to undertake the EIA and compile the draft EIA Report ("EIAR") (including the draft EMP)	40 days
18	EAP to notify registered I&APs (incl. the State departments) of the availability of the draft EIAR for comment.	7 days
19	Commenting period of 60 days for I&APs and State departments.	60 days
20	EAP to consider the comments received and complete the final EIAR.	7 days
21	Following the commenting period the EAP to submit the final EIR together with any comments received on the final EIR to the Department.	7 days
22	Department to acknowledge EIR.	10 days
23	After having received the EIR, the Department to decide whether or not to grant or refuse Environmental Authorisation (within 107 days)	137 days
24	Applicant/EAP to notify I&APs of outcome and if authorised may only commence 20 days after the date of the authorisation.	20 days

EIA PROCESS	
TASK	TIMEFRAMES
Submit NEMA Application and Draft Scoping Report (FSR) and Plan of Study for EIA to D:E&NC and distribute to registered I&APs for comment	July 2020
Submit Final Scoping Report and Plan of Study to D:E&NC for a decision	October 2020
Receive approval for the FSR and the Plan of Study for EIA.	December 2020
Compile the Draft Environmental Impact Report (EIR) for public comment based on specialist information.	December 2020
Submit Draft EIR for public comment.	January 2021
Receive responses to the Draft EIR.	March 2021
Preparation of a FINAL EIR and submission to D:E&NC.	April 2021

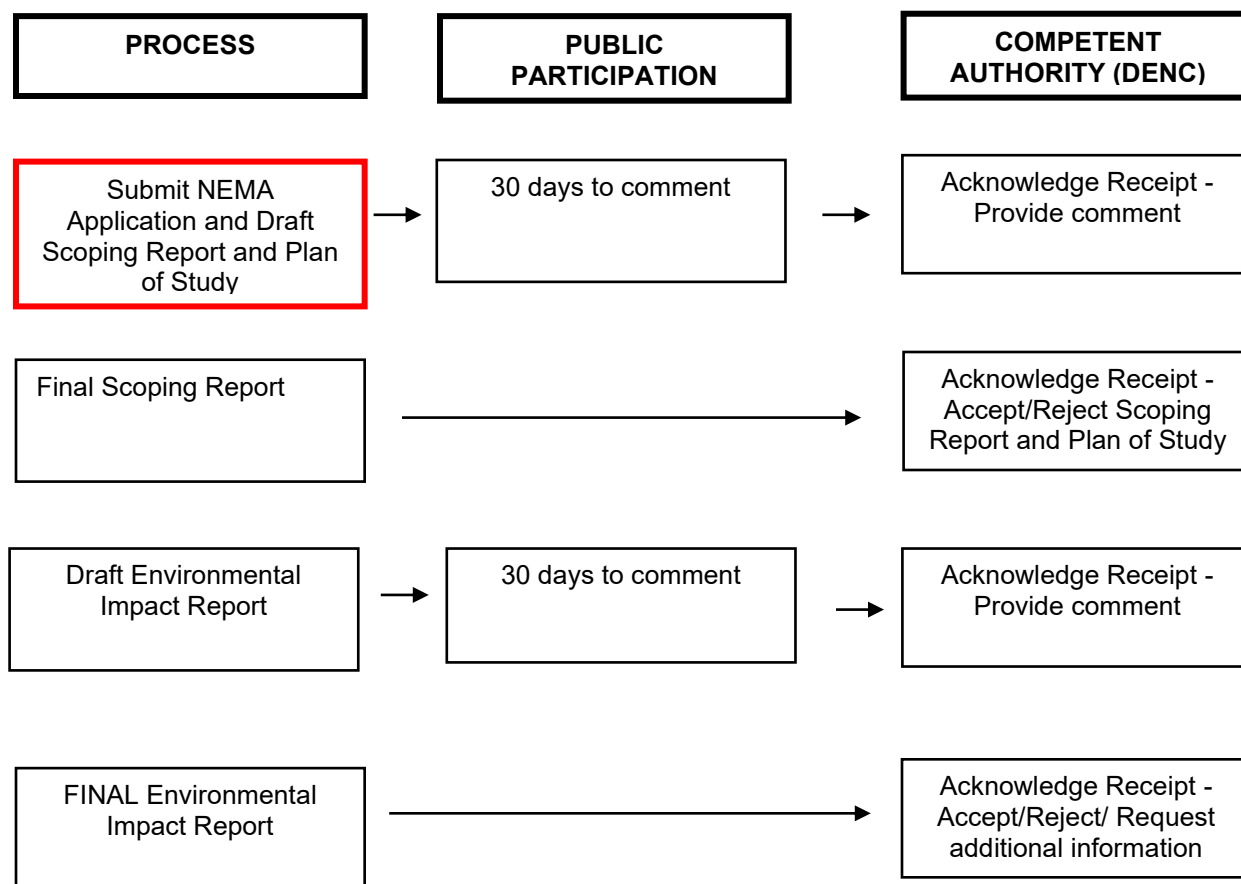


Figure 8. Summary of the EIA process and public participation process. The red indicates the stages where the competent authority will be consulted during the process.

9.2 PUBLIC PARTICIPATION AND INTERESTED AND AFFECTED PARTIES

Please refer to Figure 7 to see where the public participation process is present in the environmental impact assessment. The Interested and Affected Parties will have a chance to view and comment on all the reports that are submitted. The figures also indicated what timeframes are applicable to what stage in the process. If required, meetings with key stakeholders will be held.

At the end of the comment period, the EIR will be revised in response to feedback received from I&APs. All comments received and responses to the comments will be incorporated into the Final Environmental Impact Report (EIR). The Final EIR will then be submitted to D:E&NC for consideration and decision-making.

Correspondence with I&APs will be via post, fax, telephone, email and newspaper advertisements.

Should it be required, this process may be adapted depending on input received during the on-going process and as a result of public input. D:E&NC will be informed of any changes in the process.

9.3 CRITERIA FOR SPECIALIST ASSESSMENT OF IMPACTS

As a result of the environmental issues and potential impacts identified in *Section 6*, the need for the following specialist studies has been identified:

- Biodiversity Assessment
- Freshwater Assessment
- Heritage Impact Assessment

The impacts of the proposed activity on the various components of the receiving environment will be evaluated in terms of duration (time scale), extent (spatial scale), magnitude and significance as outlined in Table 1. These impacts could either be positive or negative.

The magnitude of an impact is a judgment value that rests with the individual assessor while the determination of significance rests on a combination of the criteria for duration, extent and magnitude. Significance thus is also a judgment value made by the individual assessor.

Table 2. Criteria used for evaluating impacts

Criteria	Category
Nature of impact	This is an evaluation of the effect that the construction, operation and maintenance of a proposed dam would have on the affected environment. This description should include what is to be affected and how.
Duration (Predict whether the lifetime of the Impact will be temporary (less than 1 year) short term (0 to 5 years); medium term (5 to 15 years); long term (more than 15 years, with the Impact ceasing after full implementation of all development components with mitigations); or permanent.	Temporary: < 1 year (not including construction) Short-term: 1 – 5 years Medium term: 5 – 15 years Long-term: >15 years (Impact will stop after the operational or running life of the activity, either due to natural course or by human interference) Permanent: Impact will be where mitigation or moderation by natural course or by human interference will not occur in a particular means or in a particular time period that the impact can be considered temporary
Extent (Describe whether the impact occurs on a scale limited to the site area; limited to broader area; or on a wider scale)	Site Specific: Expanding only as far as the activity itself (<i>onsite</i>) Small: restricted to the site's immediate environment within 1 km of the site (<i>limited</i>) Medium: Within 5 km of the site (<i>local</i>) Large: Beyond 5 km of the site (<i>regional</i>)
Intensity (Describe whether the magnitude (scale/size) of the Impact is high; medium; low; or negligible. The specialist study must attempt to quantify the magnitude of impacts, with the rationale used explained)	Very low: Affects the environment in such a way that natural and/or social functions/processes are not affected Low: Natural and/or social functions/processes are slightly altered Medium: Natural and/or social functions/processes are notably altered in a modified way High: Natural and/or social functions/processes are severely altered and may temporarily or permanently cease
Probability of occurrence Describe the probability of the Impact <u>actually</u> occurring as definite (Impact will occur regardless of mitigations)	Improbable: Not at all likely Probable: Distinctive possibility Highly probable: Most likely to happen Definite: Impact will occur regardless of any prevention measures

Status of the Impact Describe whether the Impact is positive, negative (or neutral).	Positive: The activity will have a social/ economical/ environmental benefit Neutral: The activity will have no affect Negative: The activity will be socially/ economically/ environmentally harmful
Degree of Confidence in predictions State the degree of confidence in predictions based on availability of information and specialist knowledge	Unsure/Low: Little confidence regarding information available (<40%) Probable/Med: Moderate confidence regarding information available (40-80%) Definite/High: Great confidence regarding information available (>80%)
Significance (The impact on each component is determined by a combination of the above criteria and defined as follows) The significance of impacts shall be assessed <u>with and without mitigations</u> . The significance of identified impacts on components of the affected biophysical or socio-economic environment (and, where relevant, with respect to potential legal requirement/s) shall be described as follows:	No change: A potential concern which was found to have no impact when evaluated Very low: Impacts will be site specific and temporary with no mitigation necessary. Low: The impacts will have a minor influence on the proposed development and/or environment. These impacts require some thought to adjustment of the project design where achievable, or alternative mitigation measures Moderate: Impacts will be experienced in the local and surrounding areas for the life span of the development and may result in long term changes. The impact can be lessened or improved by an amendment in the project design or implementation of effective mitigation measures. High: Impacts have a high magnitude and will be experienced regionally for at least the life span of the development, or will be irreversible. The impacts could have the no-go proposition on portions of the development in spite of any mitigation measures that could be implemented.

In addition to determining the individual impacts against the various criteria, the element of mitigation, where relevant, will also be brought into the assessment. In such instances the impact will be assessed with a statement on the mitigation measure that could/should be applied. An indication of the certainty of a mitigation measure considered, achieving the end result to the extent indicated, is given on a scale of 1-5 (1 being totally uncertain and 5 being absolutely certain), taking into consideration uncertainties, assumptions and gaps in knowledge.

Table 3: The stated assessment and information will be determined for each individual issue or related groups of issues and presented in descriptive format in the following table example or a close replica thereof.

Impact Statement:		
Mitigation:		
Ratings	Duration	
	Extent	
	Intensity	
	Probability of impact	
	Status of Impact (Positive/negative)	
	Degree of confidence	
Significances	Significance without Mitigation	
	Significance <u>WITH</u> Mitigation	
Indication of the certainty of a mitigation measure considered, achieving the end result to the extent indicated, is given on a scale of 1-5 (1 being totally uncertain and 5 being absolutely certain), taking into consideration uncertainties, assumptions and gaps in knowledge		
Legal Requirements (Identify and list the specific legislation and permit requirements which are relevant to this development):		

10. CONCLUSION AND RECOMMENDATIONS

A scoping exercise is being undertaken to present the proposed activities to the I&APs and to identify environmental issues discussed in this report and concerns raised as a result of the proposed development alternatives to date. The issues and concerns were raised by I&APs, authorities, the project team as well as specialist input, based on baseline studies undertaken.

This Draft Scoping Report, being undertaken in terms of NEMA, summarises the process undertaken, the alternatives presented, and the issues and concerns raised.

As a result of the above, the need for the following specialist studies, have been identified:

- Biodiversity Assessment
- Freshwater Assessment
- Heritage Impact Assessment

Any further issues raised as a result of the Public Participation Process will be dealt with during the EIA phase.

The significance of the impacts associated with the alternatives proposed will be assessed in these specialist studies, as part of the EIA. Once the specialist studies have been completed, they will be summarised in an Environmental Impact Report (EIR), which integrates the findings of the assessment phase of the EIA.

Based on the significance of the issues raised during the ongoing Public Participation Process and Scoping Phase, it is evident that an Environmental Impact Assessment (EIA) is required. ***It is therefore recommended that authorisation for the commencement of an EIA for the proposed development is granted.*** Should the EIA process be authorised, the significant issues raised in the process to date will be addressed and the specialist studies noted in this report, will be undertaken.

11. DETAILS AND EXPERTISE OF THE EAP

This Draft Scoping Report was prepared by Clinton Geyser who has a MSc. Degree in Environmental Management. He has been working as an Environmental Assessment Practitioner since 2009 and is currently employed at EnviroAfrica CC.

Report compiled by Clinton Geyser -

Qualifications:

- BSc. Earth Sciences, Majors in Geology and Geography and Environmental Management (1998 – 2000) and;
- BSc. (hons): Geography and Environmental Management (2001) and;
- MSc. Geography and Environmental Management (2002), all from the University of Johannesburg.

Expertise:

Clinton Geyser has over ten years' experience in the environmental management field as an Environmental Assessment Practitioner and as an Environmental Control Officer, having worked on a variety of projects in the Western, Eastern and Northern Cape. Previous completed applications include, but not limited to:

- Civil engineering infrastructure including pipelines, Wastewater Treatment Works, and roads in the Western and Northern Cape.
- Agricultural developments, including reservoirs and dams, in the Western and Northern Cape.
- Telecommunications masts in the Western and Eastern Cape
- Housing Developments in the Western and Northern Cape.
- Resort developments in the Western and Northern Cape.
- Cemeteries in the Western Cape
- Waste Management Licences in the Western Cape

Employment:

Previous employment as an EAP: Doug Jeffery Environmental Consultants (2009 – 2012)

Current employment: EnviroAfrica cc (2012 – present).

The whole process and report was supervised by Bernard de Witt who has more than 20 years' experience in environmental management and environmental impact assessments.

(-----END-----)

ANNEXURE K: SANRAL NO-OBJECTION



Reference:

Date:

(ENQ.PC.SAN) 201012 Wegdraai Township Establishment Project

12 October 2020

South African National Road Agency Limited
Private Bag X19
Bellville
7530

ATT: Me René de Kock / Shaun Dyers

PROJECT: WEGDRAAI FORMALISATION AND TOWNSHIP ESTABLISHMENT PROJECT

INVOLVED PROPERTIES SUMMARY:

- ERF 1, WEGDRAAI, KENHARDT RD, !KHEIS LOCAL MUNICIPALITY, NORTHERN CAPE PROVINCE;
- ERF 45, WEGDRAAI, KENHARDT RD, !KHEIS LOCAL MUNICIPALITY, NORTHERN CAPE PROVINCE;
- ERF 47, WEGDRAAI, KENHARDT RD, !KHEIS LOCAL MUNICIPALITY, NORTHERN CAPE PROVINCE

The above mentioned matter, as well as the attached documentation, refer.

Our office, Macroplan Town and Regional Planners, has been appointed by Barzani Development on behalf of the Department of Cooperative Governance, Human Settlements and Traditional Affairs (hence referred to as COGHSTA), to facilitate the needed town planning procedures involved with the formalisation of the existing informal properties in Wegdraai, as well as provide additional properties for future growth. Due to the twofold objective, the term township establishment will henceforth be used as the project description. Wegdraai has experienced normal population growth over the past few years, however, the provision of formal registered residential properties were never established to accommodate the population growth in Wegdraai. Residents had no other option than to resort to informal housing by means of occupying municipal or state owned land without undergoing the necessary town planning processes. COGHSTA is currently in the process of addressing the housing backlog within the Northern Cape, with numerous township establishment projects already identified of which the communities of the !Kheis Local Municipality forms part of.

In terms of the Spatial Planning and Land Use Management Act, No. 16 of 2013, approval / input from any state or semi-state department is required for any development that can directly or indirectly impact on the general functioning of said departments (in this instance the South African National Roads Agency SOC Ltd, from here on referred to as SANRAL). The development site, which comprises of portions of three registered land units, borders to the N10 National Road, as such approval in terms of the South African National Roads Agency Limited and National Roads Act, 1998 (Act 7 of 1998), is required for this proposed township establishment project. In the case of the land portions involved, the objective is to have the properties subdivided and rezoned, in terms of the Spatial Planning and Land Use Management Act, No. 16 of 2013, as part of the formalisation of the existing informal properties of Wegdraai, as well as make provision for future population growth of the said settlement.

It should furthermore be noted that **no direct accesses** from the N10 National Road are requested as part of the Wegdraai Township Establishment Project.

WEGDRAAI TOWNSHIP ESTABLISHMENT PROJECT DESCRIPTION:

The undertaking of the township establishment project, consisting of 360 residential erven, for the Wegdraai Community by Macroplan derives from an indirect appointment by COGHSTA and is therefore a project of national and provincial importance. The development site comprise of sections of Erven 1, 45 & 47, Wegdraai that can be best described as outlining the existing town of Wegdraai. The township establishment project pertains to portions of three registered land units, all held under the ownership of the !Kheis Municipality, with one of these land units bordering to the N10 to the east. The proposed township establishment project will provide sub-economic housing with the end goal of securing ownership of land for the current residents. An estimate of approximately 200 informal stands currently exists in the town of Wegdraai that will be formalised as part of this township establishment project, whilst an additional 160 erven will be created for the future expansion of the community. The Wegdraai township establishment project entails the design of a formal coherent town planning layout through a SPLUMA process, which is informed by numerous specialist studies.

At this stage the project has progressed to a point where a concept layout (Annexure C) has been prepared that may be subject to minor alterations to comply with the findings of the specialist studies and or other organs of state, but the general layout and functioning thereof should be maintained. One of the main instructions from COGHSTA and the local municipality, was to accommodate the existing informal houses as best possible. Fortunately all of the existing informal properties that have been erected do not impact negatively on the N10, in terms of appropriate building lines.

The latest concept layout has been designed to formalise the existing informal residential stands, make provision for residential expansion and to incorporate land uses such as business, institutional (churches) and recreational uses, whilst providing a coherent internal road network that promotes easy and accessible movement throughout.

INFORMATION CONCERNING SANRAL:

The township establishment project for Wegdraai borders to the N10 National Road, as such SANRAL needs to be informed of the planned development, the requirements and feedback from SANRAL needs to be obtained and ultimately approval from SANRAL is required. The following aspects may be highlighted that is of utmost importance:

- **SPLUMA Process:** The township establishment project for Wegdraai is a legal process guided by the Spatial Planning and Land Use Management Act (Act 16 of 2013) and this legislation clearly states that all state and semi-state departments need to be informed of any developments that may directly or indirectly impact on the general functioning of said departments. The properties that comprise the study area will impact on the N10 National Road, as such, SANRAL needs to be informed of the planned township establishment project and an approval/ no-objection, South African National Roads Agency Limited and National Roads Act, 1998 (Act 7 of 1998), is needed before the land use change application can be submitted to the local authority. It is hereby requested that SANRAL review this formal notification letter and issue an approval in this regard, should the proposed layout comply with the requirements and standards of SANRAL.
- **Compliance with Municipal Spatial Development Framework:** The portions of land identified for the Wegdraai Township Establishment Project falls within the urban edge of Wegdraai and has furthermore been earmarked (See Annexure E) for low-cost housing, as such the development proposal is in line with the spatial vision of Wegdraai.
- **Distance from Provincial Roads:** As per the attached detail layout plan (Annexure C), a 30m buffer between the road reserve of the N10 National Road and first residential properties has been implemented. This 30m building line has been indicated by a red line on the planning diagram attached as Annexure D.
- **Proposed access points:** No direct accesses from the N10 National Road are requested for the Wegdraai Township Establishment Project.

The requested approval must provide a no-objection towards the processes of subdivision and rezoning, as well as any other land use changes that the planned township establishment may require. This inclusion of a no-objection towards the processes of subdivision and rezoning is needed in order to proceed with the submission of the formal land use change application at the local municipality.

The objectives of this letter are as follow:

1. To notify SANRAL of the proposed township establishment project;
2. To obtain a no-objection for the land use changes (subdivision and rezoning), in terms of the Spatial Planning and Land Use Management Act (Act 16 of 2013), that needs to be followed for the planned township establishment;
3. To obtain approval in terms of the South African National Roads Agency Limited and National Roads Act, 1998 (Act 7 of 1998);

In order to supplement this letter, please find the following documents attached:

- A. Copy of Title Deed
- B. Locality Map
- C. Preferred Township Establishment Layout
- D. Planning Diagram indicating proposed development in relation to the N10
- E. SDF Map

Kindly take note that this submission is lodged in accordance to the provision of the !Kheis Final SPLUMA By-Laws and according to §32.(1) of this policy, if an organ of state fails to comment or provide information within 60 days from the date of which this notification letter has been furnished, that organ of state is deemed to have no comment or information to furnish.

Please let us know if this letter for an approval meets your requirements and if any additional information needs to be provided. We trust that you will find these matters to be in order and if there are any additional components we can assist you with, please do not hesitate to request such information

We look forward to your inputs in this regard. Please feel free to contact our office in the case of any further enquiries.

Yours Sincerely,



Justus Petrus Theron Pr.Pln. A/2394/2016

M +27 82 821 1024
T +27 54 332 3642
E jptheron@mweb.co.za

ANNEXURE L: DRPW NO-OBJECTION



Reference:

Date:

(ENQ.PC.DRPW) 201008 Wegdraai Formalisation and Township Establishment Project

08 October 2020

Head of the Department of Roads and Public Works
PO Box 3132
Squarehill Park
Kimberley
8300

Attention: Menelisi Sithole

PROJECT: WEGDRAAI FORMALISATION AND TOWNSHIP ESTABLISHMENT PROJECT

INVOLVED PROPERTIES SUMMARY:

- ERF 1, WEGDRAAI, KENHARDT RD, !KHEIS LOCAL MUNICIPALITY, NORTHERN CAPE PROVINCE
- ERF 45, WEGDRAAI, KENHARDT RD, !KHEIS LOCAL MUNICIPALITY, NORTHERN CAPE PROVINCE
- ERF 47, WEGDRAAI, KENHARDT RD, !KHEIS LOCAL MUNICIPALITY, NORTHERN CAPE PROVINCE

The above mentioned matter, as well as the attached documentation, refer.

Our office, Macroplan Town and Regional Planners, has been appointed by Barzani Development on behalf of the Department of Cooperative Governance, Human Settlements and Traditional Affairs (hence referred to as COGHSTA), to facilitate the needed town planning procedures involved with the **formalisation of the existing informal properties in Wegdraai, as well as provide additional properties for future growth**. Due to the twofold objective, the term **township establishment** will henceforth be used as the project description. Wegdraai has experienced normal population growth over the past few years, however, the provision of formal registered residential properties were never established to accommodate the population growth in Wegdraai. Residents had no other option than to resort to informal housing by means of occupying municipal or state owned land without undergoing the necessary town planning processes. COGHSTA is currently in the process of addressing the **housing backlog** within the Northern Cape, with numerous township establishment projects already identified of which the communities of the !Kheis Local Municipality forms part of.

In terms of the Spatial Planning and Land Use Management Act, No. 16 of 2013, approval / input from any state or semi-state department is required for any development that can directly or indirectly impact on the general functioning of said departments (in this instance the Department of Roads and Public Works, from here on referred to as DRPW). The development site, which comprise of portions of three registered land units, borders to a provincial road (Kleinbegin Road), as such approval in terms of the Advertising on Roads and Ribbon Development Act, 21 of 1940, is required for this proposed township establishment project. In the case of the land portions involved, the objective is to have the properties subdivided and rezoned, in terms of the Spatial Planning and Land Use Management Act, No. 16 of 2013, as part of the formalisation of the existing informal properties of Wegdraai, as well as make provision for future population growth of the said settlement. It should furthermore be noted that two access points from the involved provincial road are also being requested, with the objective of promoting accessibility for all members of the community, as well as make provision of the future expansion of Wegdraai.

YOUR PARTNERS IN THE PLANNING PROFESSION

LEN J FOURIE PR.PLN. A/1322/2006 • JANI BRUWER PR.PLN. A/1817/2014 • WILHELMINA CORNELISSEN • JP THERON PR. PLN. A/2394/2016

BANKING DETAILS:

ACCOUNT: MACROPLAN BANK: FIRST NATIONAL BANK (FNB) BRANCH CODE: 230 604 ACCOUNT NR: 624 5223 2772 TYPE OF ACCOUNT: BUSINESS CHEQUE

WEGDRAAI TOWNSHIP ESTABLISHMENT PROJECT DESCRIPTION:

The undertaking of the township establishment project, consisting of 360 residential erven, for the Wegdraai Community by Macroplan derives from an indirect appointment by COGHSTA and is therefore a project of national and provincial importance. The development site comprise of sections of Erven 1, 45 & 47, Wegdraai that can be best described as outlining the existing town of Wegdraai. The township establishment project pertains to portion of three registered land units, all held under the ownership of the !Kheis Municipality, with these land units bordering a provincial road (Kleinbegin Road) to the north. The proposed township establishment project will provide sub-economic housing with the end goal of securing ownership of land for the current residents. An estimate of approximately 200 informal stands currently exists in the town of Wegdraai that will be formalised as part of this township establishment project, whilst an additional 160 erven will be created for the future expansion of the community. The Wegdraai township establishment project entails the design of a formal coherent town planning layout through a SPLUMA process, which is informed by numerous specialist studies. At this stage the project has progressed to a point where a concept layout (**Annexure D**) has been prepared that may be subject to minor alterations to comply with the findings of the specialist studies, but the general layout and functioning thereof should be maintained. **One of the main instructions from COGHSTA and the local municipality, was to accommodate the existing informal houses as best possible, but fortunately all of the informal properties that already exists have been erected along the existing development alignment of Wegdraai in relation to the involved provincial road.**

The latest concept layout has been designed to formalise the existing informal residential stands, make provision for residential expansion, incorporate land uses such as business, institutional (churches) and recreational uses, whilst providing a coherent internal road network that promotes easy and accessible movement throughout.

INFORMATION CONCERNING DRPW:

The township establishment project for Wegdraai pertains to one provincial road (Kleinbegin Road), with this road clearly indicated in red on the planning diagram that is attached as Annexure E to this submission. The provincial road that borders the study area to the north connects to the N10 and leads to Kleinbegin and Kenhardt. The input and approval from DRPW is a requirement before the approval for the process can be sought from the ZF Mgcau Planning Tribunal on the proposed SPLUMA land use change application. The following aspects may be highlighted and feedback from DRPW in this regard is of utmost importance:

- **SPLUMA Process:** The township establishment project for Wegdraai is a legal process guided by the Spatial Planning and Land Use Management Act (Act 16 of 2013) and this legislation clearly states that all state and semi-state departments need to be informed of any developments that may directly or indirectly impact on the general functioning of said departments. The properties that comprise the study area will impact on one provincial road, as such, DRPW needs to be informed of the planned township establishment project and an approval/ no-objection, in terms of the Advertising on Roads and Ribbon Development Act, 21 of 1940, is needed before the land use change application can be submitted to the local authority.
- **Distance from Provincial Roads:** As per SPLUMA requirements, input from DRPW should be obtained if a provincial road is being impacted on by a proposed development. In the case of the Wegdraai township establishment project a provincial road (indicated in red on planning diagram – Annexure E) borders the development sites to the north, however the existing 50m building line imposed on the registered erven of Wegdraai has been maintained within the proposed town planning layout. None of the existing informal houses have been erected within the 50m building line, as such no problems are expected in this regard.
- **Proposed access points:** At this stage the town of Wegdraai has a singular access (marked with a red circle on planning diagram – Annexure E) from the provincial road, however considering that Wegdraai has experienced significant population growth over the last few years two additional access points are proposed.
 1. **Proposed Access 1:** The town of Wegdraai has a well-established ring road that runs from the aforementioned approved access. It is proposed that this ring road also connects to the provincial road (access point marked with a blue circle on planning diagram – Annexure E) in order to create a coherent internal road network for the town of Wegdraai.

2. **Proposed Access 2:** Town planning must also take into account the future expansion of a town, as such a second access point (access point marked with a green circle on planning diagram – Annexure E) further west is proposed to cater to the western expansion of Wegdraai and allow for easy access from the provincial road for future community members.

The undertaking of a traffic impact assessment and submission of detail engineering plans can be upheld as preconditions to the approval of the proposed accesses.

The requested approval must provide a no-objection towards the processes of subdivision and rezoning, as well as any other land use changes that the planned township establishment may require. This inclusion of a no-objection towards the processes of subdivision and rezoning is needed in order to proceed with the submission of the formal land use change application at the local municipality.

The objectives of this letter are as follow:

1. To notify DRPW of the proposed township establishment project;
2. To obtain a no-objection for the land use changes (subdivision and rezoning), in terms of the Spatial Planning Land Use Management Act (Act 16 of 2013), that need to be followed for the planned township establishment;
3. To obtain approval in terms of the Advertising on Roads and Ribbon Development Act, 21 of 1940;
4. To obtain approval for the proposed access points.

In order to supplement this letter, please find the following documents attached:

- A. Wayleave application
- B. Copy of Title Deed
- C. Locality Map
- D. Preferred Township Establishment Layout
- E. Planning Diagram indicating proposed development in relation to provincial roads

Kindly take note that this submission is lodged in accordance to the provision of the !Kheis Final SPLUMA By-Laws and according to §32.(1) of this policy, if an organ of state fails to comment or provide information within 60 days from the date of which this notification letter has been furnished, that organ of state is deemed to have no comment or information to furnish.

Please let us know if this letter for an approval meets your requirements and if any additional information needs to be provided. We trust that you will find these matters to be in order and if there are any additional components we can assist you with, please do not hesitate to request such information

We look forward to your inputs in this regard. Please feel free to contact our office in the case of any further enquiries.

Yours Sincerely,

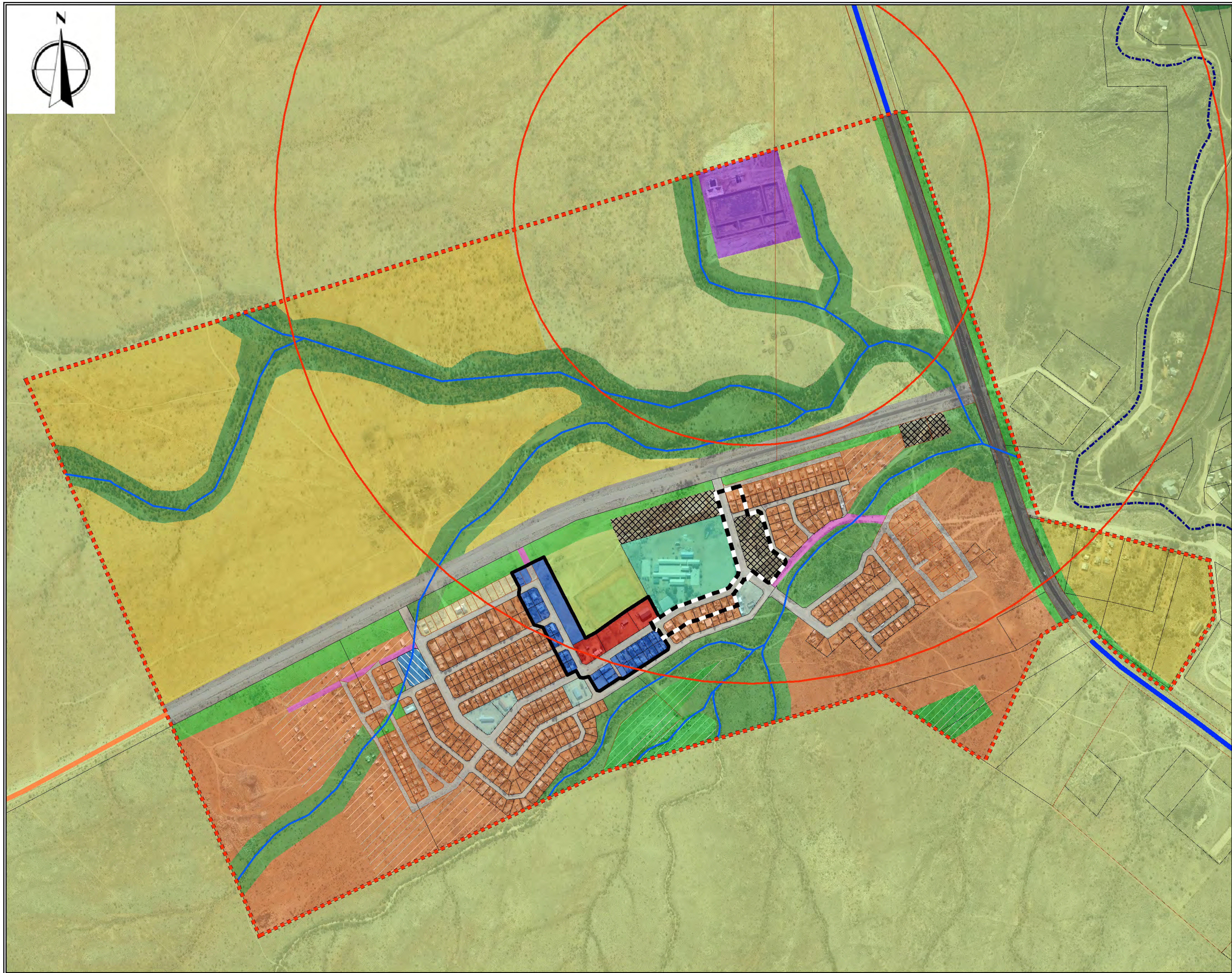


Justus Petrus Theron Pr.Pl. A/2394/2016

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ANNEXURE M: SDF MAP





Project:
!Kheis Local Municipality
SDF

Map Title:
Spatial Vision: Wegdraai



!Kheis
Munisipaliteit
Municipality

Legend:

SDF Spatial Planning Categories

- B.b.2. Rivers or Riverbeds
- B.b.3. Other Natural Areas
- B.c.2. Landscaped Areas
- B.c.2. Public Park
- C.a.1. Agriculture
- C.a.2. Agricultural Industry
- D.f.1. Place of Instruction
- D.f.2. Place of Worship
- D.g. Authority Areas
- D.h. Residential Areas
- D.h.1. Single Residential
- D.h.2. Group Housing
- D.h.3. Flats
- D.h.4. Accommodation Facilities
- D.h.5. Low Cost Housing
- D.h.6. Informal Housing
- D.i. Business Areas
- D.m. Mixed Use Development Areas
- D.n. Cemeteries
- D.o. Sports Fields & Infrastructure
- E.c. Light Industry
- E.d. Heavy Industry
- F.a. National Roads
- F.a. National Roads (Outside of Urban Edge)
- F.c. Minor Roads
- F.c. Minor Roads (Outside of Urban Edge)
- F.d. Public Streets
- F.d. Public Streets (Formalisation Proposed)
- F.g. Power Lines & Associated Infrastructure
- F.h. Telecommunications Infrastructure
- F.i. Renewable Energy Structures
- F.j.1. Minor Dams & Reservoirs
- F.j.2. Major Dams & Reservoirs
- F.l. Sewerage Plants & Refuse Areas

SDF Structuring Elements

- Hospitality Zone
- Canals
- Central Business District
- Corridors
- Nodes
- Potential Surface Water
- Risks_WWTW_1000m
- Risks_WWTW_500m
- Urban Edge



MACROPLAN
TOWN & REGIONAL PLANNERS
TOWN & REGIONAL PLANNERS
PO Box 107, Lingskop 8001
054 232 3642
macroplan@mevo.co.za
www.macroplan.co.za

Map No:
Map 03

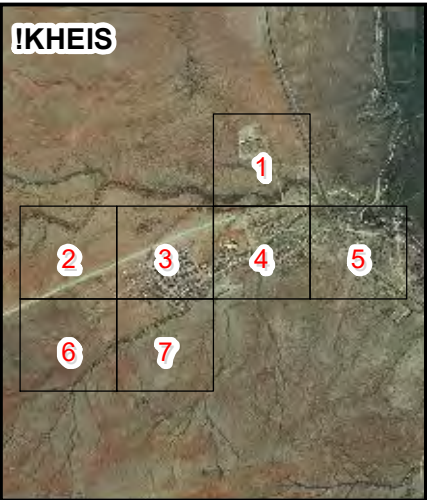
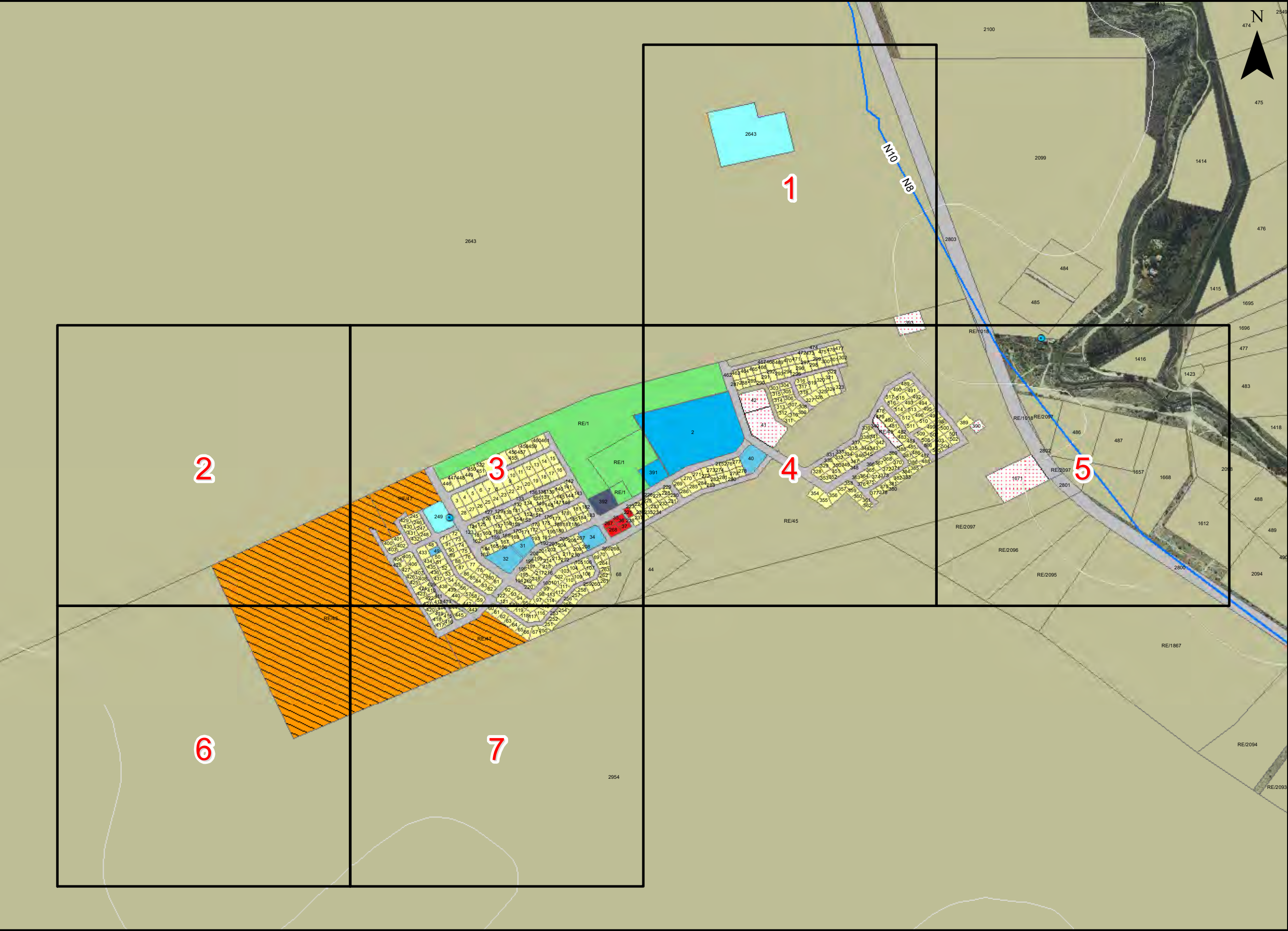
Date:
November 2016

Drawn by:
Justus Petrus Theron Pr.Pl.n. A /2394/2016

Scale:


ANNEXURE N: ZONING MAP

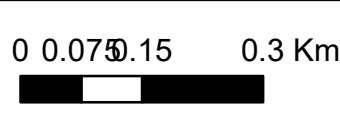




- LAND USE ZONES:**
- Agricultural Zone I
 - Agricultural Zone II
 - Authority Zone I
 - Authority Zone II
 - Business Zone I
 - Business Zone II
 - Business Zone III
 - Business Zone IV
 - Business Zone V
 - Business Zone VI
 - Industrial Zone I
 - Industrial Zone II
 - Industrial Zone III
 - Industrial Zone IV
 - Institutional Zone I
 - Institutional Zone II
 - Institutional Zone III
 - Open Space Zone I
 - Open Space Zone II
 - Open Space Zone III
 - Residential Zone I
 - Residential Zone II
 - Residential Zone III
 - Residential Zone IV
 - Residential Zone V
 - Residential Zone VI
 - Resort Zone I
 - Special Zone
 - Transport Zone I
 - Transport Zone II
 - Transport Zone III
 - Undetermined
 - Utility Zone I
 - Utility Zone II
 - Utility Zone III

KEY:

- | | | | | | |
|-------------|----------------|---------------------------|---------------------|-------------------|-----------|
| Reservoirs | Railway | Proposed HV Line | !Kheis | Rivers | Main Dams |
| Substations | Main Roads | Eskom HV Lines | Settlement Boundary | Rivers 50m Buffer | Wetlands |
| | National Roads | Eskom HV Lines 15m Buffer | 20m Contours | Secondary Roads | Game Farm |



ANNEXURE O: SACPLAN REGISTRATION CERTIFICATES





The South African
Council *for* Planners
S A C P L A N

REGISTRATION CERTIFICATE

Issued in terms of Section 13 (4) of the Planning Profession Act, 2002
(Act 36 of 2002)

This is to Certify that

Justus Petrus Theron

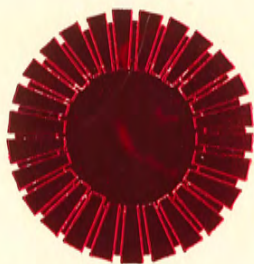
I.D. NUMBER 9106135096085

is registered as a

Professional Planner

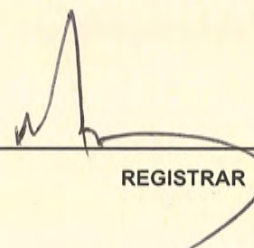
In terms of the Planning Profession Act, 2002 and is authorised
to act as such in accordance with the said Act and the Rules
prescribed thereunder.

Issued under the Seal of the Council



REGISTRATION NUMBER: A/2394/2016


CHAIRPERSON


REGISTRAR

25 / 11 / 2016
DATE



The South African
Council *for* Planners
S A C P L A N

REGISTRATION CERTIFICATE

Issued in terms of Section 13 (4) of the Planning Profession Act, 2002
(Act 36 of 2002)

This is to Certify that

Len Jacobus Fourie

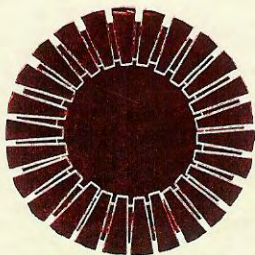
I.D. NUMBER 7411095141083

is registered as a

Professional Planner

In terms of the Planning Profession Act, 2002 and is authorised
to act as such in accordance with the said Act and the Rules
prescribed thereunder.

Issued under the Seal of the Council




CHAIRPERSON


REGISTRAR

REGISTRATION NUMBER: A/1322/2006

06/06/2007
DATE