PROPOSED TOWNSHIP DEVELOPMENT ON PLOT 2627 AND ERF 131, GROOTDRINK, !KHEIS LOCAL MUNICIPALITY

FINAL

ENVIRONMENTAL IMPACT ASSESSMENT REPORT

D:E&NC reference number: NC/EIA/14/ZFM/!KHE/GRO2/2020

APRIL 2021

!KHEIS LOCAL MUNICIPALITY

PROPOSED NEW TOWNSHIP DEVELOPMENT ON PORTION 16 OF FARM 48, GROOTDRINK, !KHEIS LOCAL MUNICIPALITY, NORTHERN CAPE

D:E&NC Ref No.: NC/EIA/14/ZFM/!KHE/GRO2/2020

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EXECUTIVE SUMMARY

Introduction

The !Kheis Local Municipality is proposing that a new township development, consisting of approximately 370 erven and associated infrastructure on Plot 2627 and Erf 131, Grootdrink, !Kheis Local Municipality. The total area to be developed measures 36 (thirty-six) hectares. The proposed development will be comprised of approximately:

- **370 x Residential Zone I units**: dwelling house/ residential house containing 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;
- **3 x Business Zone I units**: business building / premises which will be used as shops and/or offices (e.g. professional offices, places of assembly, doctors consulting rooms);
- **1 x Institutional Zone I unit**: Place of Instruction / Education;
- **3 x Institutional Zone II units**: place of worship (e.g. places for practising religion);
- **11 x Open Space II units:** public open space to be utilized by the public as an open space, park, garden, playground, or recreational site;
- **1 x Transport Zone I unit**: public street reserved for street purposes and includes facilities for public transport;
- **1 x Authority Zone I unit:** land/ erven and buildings utilized by local and district municipality to carry out mandatory functions; and
- **8 x Undetermined Zone units:** Referred to properties previously zoned 'undetermined' or other abolished zones in previous schemes which cannot be appropriately converted to a new use zone;

The proposed site is located approximately 12km east of Grootdrink, west of the N10 and the Orange River, and is situated within Ward 2 of the !Kheis Local Municipality, ZF Mgcawu District Municipality, Northern Cape. The proposed site is located at the following location: 28°33'46.40"S; 21°44'28.45"E.

The applicant is !Kheis Local Municipality who will undertake the activity should this application 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).

The Application Form and Draft Scoping Report was submitted to the DENC on the **29th July 2020**. The Final Scoping Report and Plan of Study for this EIA was submitted to the Department of Environment and Nature Conservation (DENC) on the **8th October 2020**. The Scoping Report and Plan of Study for EIA were approved by DENC on the **11th December 2021** and EnviroAfrica were advised to proceed with the EIA process (**Appendix 1B**).

Environmental Requirements

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. The 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 (in line with a full EIA) is required for the following listed activities for the proposed housing development:

Government Notice R327 (Listing Notice 1) listed activities:

9 *The development of infrastructure exceeding 1000 metres in length for the bulk transportation of water or storm water;*

(i) with an internal diameter of 0,36 metres or more; or

(ii) with a peak throughput of 120 litres per second or more;

excluding where;

a) such infrastructure is for bulk transportation of water or storm water or storm water drainage inside a road reserve or railway line reserve; or

b) where such development will occur within an urban area.

10 *The development and related operation of infrastructure exceeding 1000 metres in length for the bulk transportation of sewage, effluent, process water, waste water, return water, industrial discharge or slimes*

(i) with an internal diameter of 0,36 metres or more; or

(ii) with a peak throughput of 120 litres per second or more;

excluding where;

(a) such infrastructure is for the bulk transportation of sewage, effluent, process water, waste water, return water, industrial discharge or slimes inside a road reserve or railway line reserve; or

(b) where such development will occur within an urban area.

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;

Need and Desirability

Housing is a national need, including in the !Kheis Local Municipality.

The !Kheis Local Municipality aims to promote socioeconomic development through the eradication of backlogs associated with housing, water and sanitation, and electricity, as well as improve basic services within Boegoeberg and the surrounding area. In order to meet the needs of the community within Boegoeberg (Brandboom), the Council resolved that a project business plan be submitted to Co-operative Governance, Human Settlements and Traditional Affairs (COGHSTA) for this proposed development. 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. Suitable land for this purpose was previously identified in Boegoeberg, Groblershoop, Topline, Wegdraai, Grootdrink, Gariep, and Opwag. The provision of affordable housing remains a high priority for the Municipality which aims to restore the dignity of disadvantaged people by providing shelter and access to basic human rights as enshrined in the Constitution of South Africa.

The proposed Grootdrink 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 Grootdrink Township. According to the SDF, the population for Grootdrink was 2180 in 2001, growing to 2645 in 2011 and projected increase in population to 3028 in 2020 and 3674 in 2030. This highlights the need for more housing opportunities within the Grootdrink area. 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 where currently, approximately 23.8% of households in Grootdrink use pit toilets without ventilation. . 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 Grootdrink 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.

Site Description

The proposed site is located approximately 48km south east of Upington (as the crow flies) and is located west of the N10 and Orange River. The proposed site is situated within Ward 2 of the !Kheis Local Municipality, ZF Mgcawu District Municipality, Northern Cape. The proposed site is located at the following location: 28°33'46.40"S; 21°44'28.45"E

The site includes various areas already degraded or disturbed, this include a number of illegal dumping sites, an area which seems to contain old sewerage ponds and an area where sewerage is running through the veld from a potentially broken pipeline. The remaining site is covered by sparse shrubland, typically found in the Bushmanland Arid Grassland vegetation type (of which the site is situated in) on shallow soils on weathering rock dominated by quartz and calcrete. Although grasses were common, they were not as conspicuous as expected which may be attributed to intensive grazing by livestock. The effect of grazing is

also visible through most of the veld, with most plants reduced to small or dwarf shrubs as a result of grazing and species restricted to the hardy unpalatable plant kind.

Alternatives

Site Alternatives

The proposed site is the only viable site available at this stage and the only one that was investigated in this application. The current land use, namely the Grootdrink Settlement, is in line with the nature of the proposed development. The construction of the proposed housing development in another location would increase the construction footprint and therefore, the impact on the environment. Housing is a constant need in the municipality, with other sites possibly earmarked for residential development that will not form part of this application.

Layout Alternatives

Four (4) design layouts were proposed of which Alternative 4 was the preferred layout. Alternative 4 was preferred due to this layout being in line with recommendations and information received from the Botanical Impact Assessment (Appendix 6A), Heritage Impact Assessment (Appendix 6B), Freshwater Impact Assessment (Appendix 6C), Geotechnical Investigation (Appendix 6D), SPLUMA Application (Appendix 4A), and Engineer's Services Report (Appendix 4B). Alternative 4 is also the preferred layout due to information received from the municipal infrastructure departments in relation to existing services infrastructure, requirements for additional land uses/ changes to proposed land uses (by the local municipality) as well as specific spacing of these land uses. This alternative also provides sufficient erven and housing opportunities (high and lower density), as well as providing for Municipal and Government land use opportunities, more Open Space and sufficient buffer zones recommended by the Botanical and Freshwater specialists. According to the SPLUMA Application (**Appendix 4A**), the erven are broken down as follows:

- 370 x Residential Zone I units;
- 3 x Business Zone I units;
- 1 x Institutional Zone I unit;
- 3 x Institutional Zone II units;
- 11 x Open Space II units;
- 1 x Transport Zone I unit;
- 1 x Authority Zone I unit; and
- 8 x Undetermined Zones.

Activity Alternatives

Activity alternatives are also 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.

No-Go Alternative

This is the option of not developing the proposed housing development. Although the no-go development might result in no potential negative environmental impacts, the direct and indirect socio-economic benefits (such as housing shortages as well as loss of potential employment and skills-development opportunities) of constructing the residential development will not be realised. The need for additional housing opportunities in the !Kheis Local Municipality will not be realised. The population in Grootdrink is predicted to increase, further impacting the non-operational wastewater treatment works which may result in increased pollution and health risks. In addition, the WWTW requires extensive maintenance and

investment to meet current demand. The predicted increase in population will result in the need for upgrades / construction of the WWTW to operate effectively and at full capacity.

Tasks to be undertaken during the EIA Phase

The following tasks must still be undertaken during the EIA phase of the process:

- Compile Draft Environmental Impact Report (EIR) for public comment based on specialist information;
- Distribute and/or make the Draft EIR available to registered Interested and Affected Parties for viewing and comment;
- Receive comments on Draft EIR. All comments received and responses to the comments will be incorporated into the Final Environmental Impact Report (EIR); and
- Preparation of a Final EIR for submission to DENC for consideration and decision-making.

Summary and Conclusions of Specialist Studies

The following specialist studies were undertaken as part of this Environmental Impact Assessment:

- Botanical Impact Assessment (Appendix 6A)
- Heritage Impact Assessment (Appendix 6B)
- Freshwater Assessment (Appendix 6C)
- Geo-technical Assessment (Appendix 6D)

***Botanical Impact Assessment**:*

According to the Botanical Impact Assessment (Appendix 6A), due to the size of the proposed project (36ha), the proposed development will result in the significant loss of vegetation of which approximately 50% (18ha) is still covered by vegetation is in a good condition. The site is located within the Bushmanland Arid Grassland vegetation type, a vegetation type which typically does not support high plant diversity. Plant species diversity, associated with the proposed site for development, was notably low. According to the Northern Cape CBA maps the proposed site falls within a CBA area however, the site will not impact on any recognised centre of endemism. Absence of grass species were attributed to anthropogenic activities including the mismanagement of land by overgrazing by livestock. The most significant botanical aspect of this site was the presence of a five (5) protected, in terms of the National Forests Act (NFA), Sheppard trees (*Boscia albitrunca*) and eight plant species protected in terms of the Northern Cape Nature Conservation Act (NCNCA). It was noted that the identified protected plant species were in a poor condition.

According to the Botanical Specialist, the proposed Boegoeberg development is likely to result in a **Medium-Low impact**, which can be reduced to a **Low impact** rating with the implementation of proposed mitigation measures and effective environmental control during the construction phase. Moreover, with the implementation of proposed mitigation measures, the proposed development is unlikely to significantly contribute to / impact the:

- Loss of vegetation type and associated habitat;
- Loss of ecological processes, including but not limited to migration patterns, pollinators, and river function;
- Loss of local biodiversity and threatened plant species; and
- Loss of ecosystem connectivity.

Faunal diversity changes through space and time and are directly influenced by anthropogenic activities. Such activities include, but are not limited to, animal husbandry (i.e. overgrazing by livestock) and human

settlements (e.g. transformation of land) (Chapin *et al*., 2000[1]). Although smaller mammals, such as genet and mice, are still expected to occur within the proposed site – apart from livestock (namely goats), none of these faunal species where observed (not even traces of their presence – e.g. droppings). It is also considered highly unlikely that game (small and large mammals) occur within the proposed development footprint due to its proximity to the settlement and the scarcity of natural hiding (i.e. vegetation structure pertinent to the site). With regards to avi-fauna, although smaller, common birds were observed during the site visit, no larger birds were observed. Because of the location (next to the existing settlement) the proposed footprint enlargement is not expected to have any significant impact on the surrounding bird populations, especially if larger trees next to the seasonal drainage lines are protected. No reptile or amphibian species were observed during the site survey. The project footprint may provide habitat for various reptile species however, these species are likely to be terrestrial species adapted to the dry Nama-Karoo environmental conditions. Amphibian species are unlikely to occur within the proposed drainage lines due to the ephemeral nature of the watercourses and degree of contamination associated with the pre-existing oxidation ponds.

The Specialist concluded that, "*with the available information it is recommended that the project be approved, with the proposed mitigation actions*".

Heritage Impact Assessment

According to the Heritage Impact Assessment (**Appendix 6B**), no significant heritage sites or features were identified within the proposed development footprint. Early (ESA) / Middle Stone Age (MSA) and 20th-century cultural material were observed and recorded outside of the proposed development footprint and were not of conservational value. Thus, the Heritage Specialists stated that no further mitigation is required for the proposed development relative to any of these heritage resources. Moreover, the Specialists concluded that from a heritage point of view, the proposed development can continue. The Grootdrink cemetery (graded as IIIB and is of High Local Significance) is situated outside the development footprint. It is recommended that the graves be fenced off with the inclusion of a 50 m buffer/safety zone. Due to the low-to-moderate 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).

Freshwater Impact Assessment

According to the Freshwater Assessment (**Appendix 6C**), two (2) small sub-catchments can be distinguished around the township of Grootdrink, namely a sub-catchment in the northern section of the proposed site with a sub-catchment area of 283ha (with a circumference of 7.4km) and a sub-catchment in the southern section with an area of 174ha (with a circumference of 6.5ha). Watercourses, namely drainage lines, are located and were identified, by the Freshwater Specialist, within the development footprint. A buffer zone of at least 15m must be maintained. Large volumes of solid waste were noted as being illegally dumped in the drainage lines.

The Present Ecological State (PES) of the riparian and instream areas of the watercourses (namely drainage lines) were scored a "B" (Largely natural with few modifications. A small change in natural habitats and biota, but the ecosystem function is unchanged) and "C" (Moderately modified. A loss and change of the natural habitat and biota, but the ecosystem function is predominantly unchanged), respectively. The Ecological Importance (EI) is based on the presence of especially fish species that are endangered on a

[1] Chapin Iii, F.S., Zavaleta, E.S., Eviner, V.T., Naylor, R.L., Vitousek, P.M., Reynolds, H.L., Hooper, D.U., Lavorel, S., Sala, O.E., Hobbie, S.E. & Mack, M.C., 2000. Consequences of changing biodiversity. Nature, 405(6783), pp.234-242.

local, regional, or national level. There are no fish in the drainage lines, as there is no permanent water. According to this assessment, which is prescribed for WULA's, the drainage line is not important. However, the Freshwater Specialist did rank the drainage lines as Ecologically Sensitive. No other endangered species, either plant or animal, were detected in or near the drainage line.

As per the Freshwater Assessment, biomonitoring was conducted at eleven (11) sampling points along the Lower Orange River, namely Augrabies Lair trust, Groblershoop, Kakamas Triple D, Hopetown Sewer, Hopetown Sewer, Keimoes Housing, Upington Erf 323, Upington Affinity, Styerkraal, Grootdrink Bridge, and Turksvy Dam. These sites were sampled based on elucidating the combined impact of the propose developments on the Orange River, and was carried out according to Dickens and Graham, (2002). The PES of the Orange River (for both riparian and instream zones) were categorized as Class C (Moderately modified - a loss and change of the natural habitat and biota, but the ecosystem function is predominantly unchanged), and is an Ecologically Important system (as classified by the Freshwater Specialist). Furthermore, the Orange River is Ecologically Sensitive.

As per the Freshwater Assessment, the management of sewage (namely the non-operational WWTW) and solid waste were identified as impacts which is highly likely to be exacerbated by the predicted increase in the population should the proposed development go ahead. Waste was noted as being illegally dumped into the drainage lines. Moreover, the distance of existing households from the existing WWTW is approximately 300m, less than the recommended distance. The cumulative impact of sewage and solid waste entering the drainage lines and Orange River were considered to have a Medium Impact which can be reduced to a Low impact should proposed mitigation measures be implemented. Other identified impacts include construction of housing around drainage lines, destruction of drainage lines, and change in drainage lines into a stormwater canal. These impacts can however be mitigated for by the implementation of a 50m wide buffer around the drainage lines.

Impacts, identified by the Freshwater Specialists, include the;

- Cumulative impact of sewage and solid waste being disposed of in the drainage line and Orange River (**Medium Severity**);
- Impact of graveyards on the drainage line riparian zone (**Medium Severity**); and
- Impact of animal husbandry, trampling by humans of drainage lines (**Medium Severity**)

The Freshwater Specialist concluded that identified impacts will have a Medium impact on the freshwater features of the site which can be reduced to a **Low impact** should proposed mitigation measures be implemented. Impacts associated with the condition of the sewage and solid waste management infrastructure are threats to the Water Use Authorisation (WUA) and authorities may insist that these issues be resolved prior to the approval of the WUA (General Authorisation).

Geotechnical Investigation

According to the Geo-technical Assessment, the proposed site for development was regarded as being of intermediate suitability for the proposed residential development where founding conditions were designated as R and S. The following are the main conclusions that have been made:

- **Geology:**

Bedrock present includes lower basalts of the Leerkrans Formation, Wilgenhoutsdrift Group and can be described as consisting of greenstone and green-schist. Volcanic features are present as metabasalt and felsic lava. Discontinuities in the basalt are open and filled with sand.

- **Hydrology:**

No perched groundwater was encountered on site during the geotechnical investigation (and is not anticipated to be problematic on site). Groundwater is expected to occur at depths less than 15m within compact, argillaceous strata. Successful drilling for water within the proposed site for development is expected to be between 40 – 60% whereas the drilling for a borehole yielding at least 2l/s ranges between 10 – 20%.

Entire site refusal of excavation on bedrock or very dense hardpan calcrete was encountered at depths ranging from 780mm deep (ranging from 100 – 1400mm). Thus, 22% of trenches to be excavated to depths of 1000mm may require drilling and blasting (and is classified as a hard excavation). If the required depth is to increase to 1500mm, 48% of the excavation may be classified as hard.

- **Geotechnical Classification:**

Overall, the entire site is regarded as suitable for residential development. The site is divided into three separate geotechnical zones.

Geotechnical Zone I

Zone classed as R (founding is stable and expected soil movement is negligible). Slope across the site is approximately between 2 – 6%. Two foundation design alternatives are applicable, namely (i) conventional strip foundations or (ii) slab-on-the-ground foundations, to be placed directly on bedrock or very dense pedocrete.

Geotechnical Zone II

Zone classed as R (founding is stable and expected soil movement is negligible). Slope across the site is approximately between 2 – 6%. Due to the geotechnical conditions on site, two founding options are applicable to the site, namely (i) conventional strip foundations or (ii) slab-on-the-ground foundations, to be placed directly on bedrock or very dense pedocrete.

Geotechnical Zone III

Zone classed as S (founding is stable and less than 10mm rapid compression settlement is expected). Slope across the site is approximately between 2 – 6%. Two foundation design alternatives are applicable, namely (i) conventional strip foundations or (ii) slab-on-the-ground foundations, to be placed directly on the medium dense to very dense residual soil or pedocretes.

In terms of general measures, the following recommendations were made:

- **Founding**: The development must take place according to the SANS 10400H and NHBRC Home Owner's Manual Guidelines (published in 2015).
- **Trench backfill:** *in situ* materials can be used for normal backfill of trenches.
- **Layer works:** Material for sub-base and base construction must be obtained from commercial sources – depending in the pavement design, G6 or G7 material may be imported for the construction of selected layer works.
- **Wearing course for gravel roads**: material for gravel wearing coarse must be obtained from commercial sources but excavated calcrete can be stockpiled for this purpose.
- **Excavation conditions:** Due to the consistency and composition of the soil present on site, manual excavation is not considered economically viable. Excavation of soils would require a TLB (rated at 55kW minimum) or a 30 ton excavator will be required for the excavation of the very dense hardpan calcrete which needs to be removed and thus, adequate financial provision must be made for hard rock excavation. Sidewalls of excavations may be susceptible to collapse. Precautionary

measures must be provided to protect workmen in these excavations - these measures may include shoring the excavations or sloping the sides to flatter than 1(V):2(H).

- **Land slope:** Average slope across 16% of the site is less than 2% which is considered as an intermediate suitability for urban development only whereas the slope of 2 – 6% on 84% of the land can be regarded as favourable for urban development.

Services

Due to the nature and size of the proposed development, an investigation into the capacities and status of existing bulk services and future bulk services required to supply the development was needed and undertaken. Bvi Consulting Engineer's compiled a Bulk Services Report (**Appendix 4B**), investigating the status of existing services and proposing recommendations relative to the construction and / or upgrade of existing infrastructure to service the proposed housing development.

Water

The Average Annual Daily Demand (AADD) was calculated at 458.7m^3/day, indicating that the existing water supply infrastructure is under pressure. Therefore, as per the Engineer's Services Report (Appendix 4B), construction / upgrades to existing water supply infrastructure have been recommended as follows:

- Upgrading the river pump station;
- Additional 160mm diameter (Class 6 PVC) pipeline between the river pump station and the existing potable water storage reservoir;
- Upgraded Water Treatment Works (with a functional capacity to deliver 74m^3/h on the existing treatment works site);
- Construction of a new 360m^3 sectional steel reservoir;
- Construction of a new 350m^3 sectional steel pressure tower;
- Construction of a new 60l/s uplifting pump station at the treatment works;
- Construction of a new 200mm pipeline (between the lifting pump station and the pressure tower); and
- Construction of a new pipeline through the planned extension to create a new ring network.

Sewerage

Households within the in the existing Grootdrink Settlement are serviced by conservancy tanks or VIP toilets as there are presently no waterborne sewer systems. The conservancy tanks are emptied by a honey sucker truck and discharged into an oxidation pond system located west of the existing Grootdrink Settlement. The total sewer flow is 546 000l/day. As per the Engineer's Services Report (Appendix 4B), construction / upgrades to existing sewage infrastructure have been recommended as follows:

- Construction of two (2) new sewer pump stations (with a functional capacity to deliver 50l/s directly to the WWTW);
- Construction of a new 250mm diameter and 160mm diameter Class 6 PVC pipelines (1600m & 1800m) between the pump stations and the upgraded WWTW (namely oxidation ponds).
- Upgrading the capacity of the WWTW (namely oxidation ponds) to service 0.7Ml per day.

Roads

Access to the development will be from the existing Residential Collector Streets (Class 4b). The Engineer concluded that no problems are foreseen regarding roads and access. As per SANRAL's response to letter raised by Macroplan – the site development plant was approved subject to compliance with conditions (such as the erection of a permanent fence on the boundary of the land development area and the national road reserve)stipulated in SANRAL's response.

Stormwater

No formal stormwater infrastructure is present within the Brandboom settlement where stormwater runoff is currently draining from the centre of the site. According to the Engineer's Services Report, the guiding principle is that the peak stormwater runoff from the site, post construction, should not exceed the full range of storm return periods (1:2 to 1:50) of the site pre-construction. Stormwater infrastructure must be constructed to:

- Accommodate minor storm events (i.e. 1:5 years) in open channels or side drains of streets;
- Accommodate major storm events (i.e. 1:50 year) through controlled overland flows, aboveground attenuation storage, and berms at the higher end of the site; and
- To prevent pooling of stormwater runoff.

In addition to parameters stipulated in the Engineer's Services Report (Appendix 4B), a Stormwater Management Plan (SWMP) must be designed and compiled to address concerns raised by the I&AP - namely the potential flow of sewage- and/or solid waste-contaminated stormwater runoff from the development into the drainage lines and subsequently the Orange River. Therefore, it is recommended that the proposed development be supported/ authorized subject to the compilation of a SWMP which includes required engineering parameters (Appendix 4B) and the management of potentially sewage- and/or solid waste-contaminated stormwater runoff.

Solid waste removal

The solid waste site will be upgraded to accommodate the additional 370 erven. According to the Integrated Development Plan, 2019 – 2022, the proportion of households in the !Kheis Municipality whose refuse is removed by a local authority at least once a week increased from 48.1% in 1996 to 62.0% in 2016. However, there was an increase in the proportion of households that have no rubbish disposal from 1.6% in 1996 to 7.6% in 2016. The IDP also states that in 2016, 21.1% of households dispose of waste via their own refuse dump. This is evident in the large amounts of domestic waste observed dumped within the proposed site for development, especially within drainage lines. As per the Engineer's Services Report, a designated spoil site, where illegal dumping has previously occurred, was proposed for solid waste management.

Electricity

As per INEP Guidelines, the expected additional load of the proposed development will initially be 444KVA. The proposed site for development falls within the Eskom Distribution area and existing electrified households purchase electricity directly from Eskom. Currently, the bulk connection to the Brandboom settlement is via a 22kV overhead line from the Eskom 10MVA Groblershoop substation – which is in the process of being upgraded to a 20MVA. The existing overhead feeder will only be able to accommodate the future additional 660kVA load once the Groblershoop 10MVA substation has been commissioned. It must be noted that the internal electrical network extension can only be carried out by Eskom after formulation processes have been completed as the area falls under Eskom's jurisdiction.

Conclusion

The specialist studies and the information provided within the EIA Report, indicates that the proposed Boegoeberg Housing development does not pose any significant impacts should the proposed mitigation measures be implemented. However, as per the specialist assessments, site visits, and comments received from registered I&APs, the failure of the wastewater treatment works and illegal dumping, especially in drainage lines, remain a key issue which must be addressed with the implementation of a proper waste management plan. The proposed project will increase the pressure placed on existing municipal services

and therefore, if a waste management plan is not effectively implemented, the current lack of sewage and solid waste management may negatively impact the environment and socioeconomic development in the Grootdrink area.

According to the Botanical Specialist (Appendix 6A), " *with the available information it is recommended that project be approved, with the proposed mitigation actions*". According to the Heritage Impact Assessment (Appendix 6B), no significant heritage sites or features were identified within the proposed development footprint. No further mitigation measures were required with regards to these resources. Therefore, from a heritage point of view, the Heritage Specialists concluded that the proposed development could continue. The Grootdrink cemetery is located outside of the proposed site for development. No other graves were identified within the development footprint. The proposed site for development is located within an area of low palaeontological significance and therefore, no further palaeontological heritage studies, ground-truthing, and/or specialist mitigation are required. As per the Freshwater Impact Assessment (Appendix 6C), the Freshwater Specialist concluded that identified impacts will have a Medium impact on the freshwater features of the site which can be reduced to a Low impact should proposed mitigation measures be implemented. Impacts associated with the condition of the sewage and solid waste management infrastructure are threats to the Water Use Authorisation (WUA) and authorities may insist that these issues be resolved (by the implementation of a waste management plan including recommendations proposed in the Engineer's Services Report) prior to the approval of the WUA (General Authorisation). According to the Geotechnical Investigation (Appendix 6D), the proposed site for development was regarded as being of intermediate suitability for the proposed residential development where founding conditions were designated as R and S.

Considering all the information, it is envisaged that this proposed Boegoeberg Housing Development will have a low negative impact on the environment, and the socio-economic benefits are expected to greatly outweigh any negative impacts. The mitigation measures, as recommended by the various specialists and detailed in the EMPr (Appendix 9) must be implemented. It must be noted that a proper waste management plan[2], addressing the functioning of the wastewater treatment works and solid waste removal to service the proposed development (i.e. existing and increase demand for these services), must be added as conditions to the granting of the environmental authorisation. This waste management plan must be implemented to address the expected increase in pressure on existing services – as per recommendations proposed and addressed in the Engineer's Services Report (Appendix 4B). In addition to parameters stipulated in the Engineer's Services Report (Appendix 4B), a Stormwater Management Plan (SWMP) must be designed and compiled to address concerns raised by the I&AP - namely the potential flow of sewage- and/or solid waste-contaminated stormwater runoff from the development into the drainage lines and subsequently the Orange River. Therefore, it is recommended that the proposed development be supported/ authorized subject to the compilation of a SWMP which includes required engineering parameters (Appendix 4B) and the management of potentially sewage- and/or solid waste-contaminated stormwater runoff.

It is therefore recommended that the proposed Boegoeberg Housing Development (**Alternative 4**) be supported and be authorised with the necessary conditions of approval, namely the compilation of a stormwater management plan and waste management plan (addressing sewage and solid waste management), along with the implementation of recommendations / mitigation measures proposed by Specialists (Appendices 6A-D) and included in the EMPr (Appendix 9).

[2]In the context of this Final EIR, "***waste management plan"*** refers to a plan addressing the wastewater treatment works and solid waste removal infrastructure / management required to service the proposed development. Please refer to Appendix 4B (Engineer's Services Report) for more information on required infrastructure. As per the specialist assessments, site visits, and comments received from registered I&APs, the management of sewage and solid waste remains a key issue which must be addressed with the implementation of a proper waste management plan.

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APPENDICES

ACRONYMS

BGIS	Biodiversity Geographic Information System
CBA	Critical Biodiversity Area
DEA	Department of Environmental Affairs
DEAT	Department of Environmental Affairs and Tourism
DENC	Department of Environment and Nature Conservation (Northern Cape)
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 Assessment Report
EMP	Environmental Management Programme
HIA	Heritage Impact Assessment
I&APs	Interested and Affected Parties
NCNCA	Northern Cape Nature Conservation (Act 9 of 2009)
NEMA	National Environmental Management Act (Act No. 107 of 1998)
NEMBA	National Environmental Management: Biodiversity Act (Act No. 10 of 2004)
NFA	National Forests Act (NFA) of 1998 (Act 84 of 1998)
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
PIA	Palaeontological Impact Assessment
SAHRA	South African Heritage Resources Agency
SANBI	South African National Biodiversity Institute
SDF	Spatial Development Framework
TIA	Traffic Impact Assessment
WULA	Water Use Licence Application

1. INTRODUCTION

1.1 BACKGROUND

The !Kheis Local Municipality is proposing that a new township development, consisting of approximately 370 erven and associated infrastructure on Plot 2627 and Erf 131, Grootdrink, !Kheis Local Municipality. The total area to be developed measures 36 (thirty-six) hectares. The proposed site is located approximately 12km east of Groblershoop, west of the N10 and the Orange River, and is situated within Ward 2 of the !Kheis Local Municipality, ZF Mgcawu District Municipality, Northern Cape. The proposed site is located at the following location: 28°33'46.40"S; 21°44'28.45"E. According to the SPLUMA Application Report (**Appendix 4A**), the erven are broken down as follows:

- 370 x Residential Zone I units: dwelling house/ residential house containing 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;
- 3 x Business Zone I: business building / premises which will be used as shops and/or offices (e.g. professional offices, places of assembly, doctors consulting rooms);
- 1 x Institutional Zone I: Place of Instruction / Education
- 3 x Institutional Zone II: place of worship (e.g. places for practising religion);
- 11 x Open Space II: public open space to be utilized by the public as an open space, park, garden, playground, or recreational site;
- 1 x Transport Zone I: public street reserved for street purposes and includes facilities for public transport;
- 1 x Authority Zone I: land/ erven and buildings utilized by local and district municipality to carry out mandatory functions.
- 8 x Undetermined Zones: Referred to properties previously zoned 'undetermined' or other abolished zones in previous schemes which cannot be appropriately converted to a new use zone;

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).

The Application Form and Draft Scoping Report was submitted to the DENC on the **29th July 2020**. The Final Scoping Report and Plan of Study for this EIA was submitted to the Department of Environment and Nature Conservation (DENC) on the **8th October 2020**. The Scoping Report and Plan of Study for EIA were approved by DENC on the **11th December 2020** and EnviroAfrica were advised to proceed with the EIA process (**Appendix 1B**).

1.2 SCOPE OF WORK

There has been no particular brief given to the consultants to undertake this study. However, the scope of the study has been determined with reference to the requirements of the relevant legislation and undertaken in terms of the Integrated Environmental Management Information Series on Environmental Impact Reporting (2004) issued by DEAT and the Information Document on Requirements with respect to the EIA Process (January 2003), issued by the Department of Environmental Affairs and Development Planning of the Western Cape.

The basic scope of work will include the following:

- Review of all information.
- Participating in the progress of the development proposal.
- Scoping (identification of significant issues).
- Assessment of anticipated impacts.
- Identification of suitable mitigation measures to reduce negative impacts and enhance positive impacts.
- Submission for decision.

One of the crucial aims of an EIA is to ensure that the demands of sustainable development are met on a project level, within the context of the greater area. The most common definition of sustainable development is development that meets the needs of the present while not compromising the needs of future generations.

This EIA is therefore being undertaken with sustainable development as a goal. The assessment will look at the impacts of the proposals on the environment and assess the significance of these, as well as propose mitigation measures, as required, to reduce anticipated impacts to acceptable levels.

Moreover, the mitigation hierarchy has been applied to arrive at the best practicable environmental option. The mitigation hierarchy is comprised of four actions which are designed to be implemented sequentially[3], namely (1) avoidance, (2) minimization, (3) rehabilitation, and (4) offset (if required), where the following actions are applicable and have been applied in the context of this environmental process to promote the best feasible environmental option:

(1) **Avoidance:** avoiding impacts on biodiversity within the proposed site of development and surrounding area and includes identifying potential risks and investigating alternatives[4]. Avoidance was carried out in the context of this process as environmental components (namely potential botanical and freshwater impacts) were identified and rated by specialists. Moreover, design alternatives were also investigated to incorporate and reduce the impact(s) on environmentally sensitive features (e.g. drainage lines). Due to the nature of this proposed development, no site alternatives were investigated – this also aids in avoiding any potential negative impact(s) on pristine areas;

(2) **Minimize potential impacts**: mitigation measures and recommendations have been proposed by the Botanical, Freshwater, Heritage, and Geotechnical Specialists to mitigate and reduce identified potential impacts. These mitigation measures and recommendations have been incorporated into the EMPr and are to be implemented during the construction and operational (where applicable) phases; and

[3]Arlidge, W.N., Bull, J.W., Addison, P.F., Burgass, M.J., Gianuca, D., Gorham, T.M., Jacob, C., Shumway, N., Sinclair, S.P., Watson, J.E. and Wilcox, C., 2018. A global mitigation hierarchy for nature conservation. *BioScience*, 68(5), pp.336-347.

[4]Phalan, B., Hayes, G., Brooks, S., Marsh, D., Howard, P., Costelloe, B., Vira, B., Kowalska, A. and Whitaker, S., 2018. Avoiding impacts on biodiversity through strengthening the first stage of the mitigation hierarchy. *Oryx*, 52(2), pp.316-324.

(3) **Rehabilitation**: as per action 2 above, mitigation measures, including the need to rehabilitate areas (which also aids in reducing erosion during the operational phase) outside the construction footprint has been included in the EMPr.

1.3 ASSUMPTIONS AND LIMITATIONS

The assumption is made that the information on which the report is based (i.e. specialist studies, project information, information given by the applicant and client, as well as mapping tools including *CapeFarmMapper* and *BGIS*) is correct.

Future management of the site is essential, and the assumption is made that the mitigation measures recommended by the specialists will be implemented on a long-term basis. This has a major bearing on the reliability of the predictions of significance of impact.

1.4 DESCRIPTION OF THE PROPOSED ACTIVITY

The !Kheis Local Municipality is proposing that a new township development, consisting of approximately 370 erven and associated infrastructure on Plot 2627 and Erf 131, Grootdrink, !Kheis Local Municipality. The total area to be developed measures 36 (thirty-six) hectares. The proposed activities are described in Section 3). The proposed site of the residential development is generally undeveloped and generally near natural.

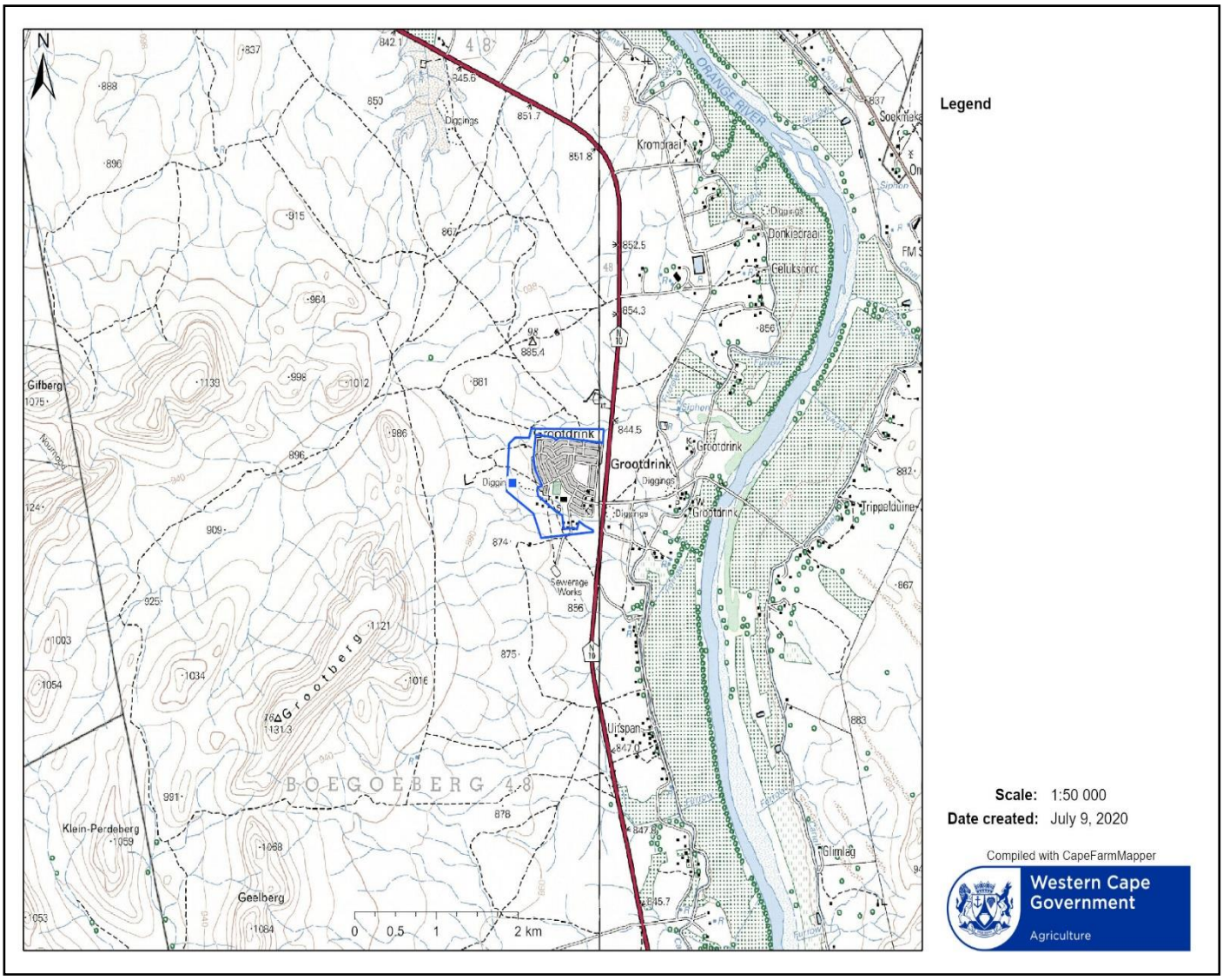


Figure 1: 1: 50 000 Locality Map showing the proposed Grootdrink Housing Development.

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.

The need for and the desirability of a proposed development forms a key component of any EIA application. The consideration of proposed developments in context of the various spatial planning tools and policy applicable to the study area forms an integral part of the present environmental processes. The "need and desirability" will be determined by considering the broader community's needs and interests as reflected in a credible IDP, SDF and EMF for the area.

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 the most sustainable use of land is. The impact of development on people's health and well-being, as well as its impact on natural and cultural areas, and therefore its desirability, will also be assessed during the Environmental Impact Report phase.

2.1 NEED

Housing is a national need, including in the !Kheis Local Municipality.

The !Kheis Local Municipality aims to promote socioeconomic development through the eradication of backlogs associated with housing, water and sanitation, and electricity, as well as improve basic services within Grootdrink. In order to meet the growing needs of the community within Grootdrink, the Council resolved that a project business plan be submitted to Co-operative Governance, Human Settlements and Traditional Affairs (COGHSTA) for this proposed development. 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 for this purpose was previously identified in Grootdrink, Boegoeberg, Topline, Wegdraai, Groblershoop, Gariep, and Opwag. The provision of affordable housing remains a high priority for the Municipality which will restore the dignity of disadvantaged people by providing shelter and access to basic human rights as enshrined in the Constitution of South Africa.

The proposed Grootdrink 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 Grootdrink Township. According to the SDF, the majority of the population in !Kheis Local Muncipality are located in five settlements, namely Groblershoop, Wegdraai, Topline, Grootdrink, and Boegoeberg. Grootdrink has an unemployment rate of 17.7%, lower than the District Municipality (19.2%) and the Northern Cape Province (27.4%). Grootdrink (54.1%), Topline (51.6%), and Wegdraai have the largest percentage of informal dwellings. Grootdrink increased from 2180 (in 2001) to 2645 (in 2011) to 3028 (in 2020 – percentage increase of 14.5%). In 2039, the population is projected to be 3674 (a percentage increase of 38.9%) – highlighting the need for formalized housing and associated services in Grootdrink. 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 Grootdrink 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 Grootdrink, 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 Grootdrink Housing Development.

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 water, electricity, roads, appropriate waste management (e.g. 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 Grootdrink 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 forms an integral component of this vision.

2.2 DESIRABILITY

The following factors determine the desirability of the area for the proposed residential development. As per the Needs and Desirability Report, prepared by Macroplan (August 2020), approximately 300 to 350 families live on the proposed site for development and are in dire need for formalization. It is clear from the number of existing informal houses erected on the property, that this study area is indeed habitable and that there is an urgent need for residential erven within the sub-economic market.

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 Grootdrink and the N10, allowing accessibility and linking to the existing services infrastructure. Any upgrades or additional services infrastructure that will be required were investigated and included in this Environmental impact Report.

Due to the existing settlement, namely the Grootdrink Settlement, the proposed development will expand the housing footprint in the immediate area. The proposed development will tie into existing services, reducing costs and environmental impact associated with the construction of a stand-alone development in an area where surrounding land uses are not in line with the nature of this project. According to the SPLUMA Application Report (**Appendix 4A**), the study area is situated within the urban edge of Grootdrink. Moreover, as per the !Kheis SDF, the portions of land identified for the Grootdrink formalisation and expansion project falls within the urban edge of Grootdrink and has furthermore been earmarked for low-cost housing, as such the development proposal is in line with the spatial vision of Grootdrink.

No other physical characteristics, excluding the presence of drainage lines through the site, of these properties or environmental constraints which would exclude the site from development.

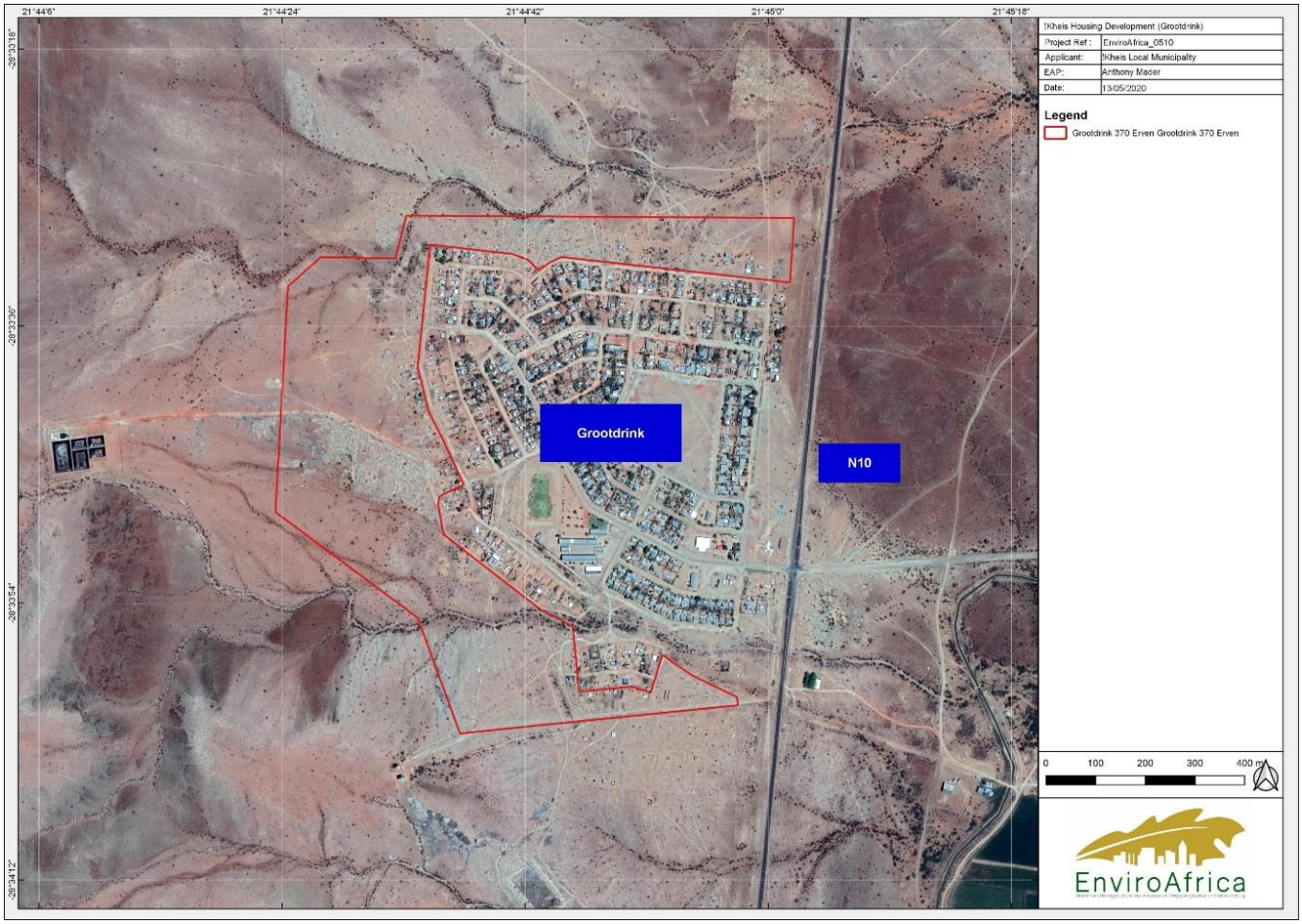


Figure 3: Proposed site for development and surrounding landscape, showing the location of the proposed development in location with the existing residential areas. QGIS, version 3.10.

2.2.2 COMPATIBILITY WITH THE SURROUNDING AREA

The proposed site is directly adjacent to the existing residential area of Grootdrink. As stated above, this would provide accessibility and allow the proposed development to link to the existing services infrastructure. The proposed site for development is situated adjacent to the existing residential area of Grootdrink (Figure 3). Although undeveloped, the area surrounding the existing residential area is highly disturbed, with numerous incidences of illegal dumping (including general and hazardous waste). Due to the close proximity of the existing Settlement, costs and environmental impacts, associated with the excavation and laying of new pipes, will be avoided as the proposed development will tie in with existing services.

The study area itself is vacant and covers a large area, with the undeveloped character clearly visible when visiting the study area. The study area is however situated directly adjacent to the community of Grootdrink and N10 National Road. As discussed above, the site is not limited by spatial constraints due to future expansion.

2.3 INTEGRATED PLANNING

According To the Department of Environmental Affairs: Integrated Environmental Management Guideline: Guideline on Need and Desirability (2017), when considering how the development may affect or promote justifiable economic and social development, the relevant spatial plans must be considered, including Municipal Integrated Development Plans (IDP), Spatial Development Frameworks (SDF) and Environmental Management Frameworks (EMF).

According to the SPLUMA Application (**Appendix 4A**), each Municipality must prepare a 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 SDF of such a municipality, which may be seen as the spatial translation of the 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.

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 SPLUMA, 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 portion of land identified for the Grootdrink Expansion Project falls within the urban edge of Grootdrink and has furthermore been earmarked (See Annexure L) for low-cost housing, as such the development proposal is in line with the spatial vision of Grootdrink

In the !Kheis Municipality Land Development Plan/ Rural Spatial Development Framework (2014), a variety of projects are identified as focus areas in terms of development. These projects stem from the various municipal IDP's and SDF's and one of the outlined areas of focus is that of housing needs in urban and rural areas throughout the district and local municipalities.

As per the SDF, the key issues raised included, but are not limited to:

- Inadequate housing;
- Lack of land for housing and farming in the area where the new informal settlements are the result of new household formation in the area and not in-movement from outside the area;
- A lack of jobs and job-creation opportunities in the area;
- Water quality and supply;
- Water channels are a safety risk for children and livestock
- Dependency of shops located in Grootdrink;
- The lack of facilities for (i) secondary schooling, (ii) sports and recreation, and (iii) where centre where senior citizens can meet; and
- Weak power supply.

According to the Northern Cape Provincial Spatial Development Framework (2019) (NCPSDF), as part of the Spatial Development Strategies for Infrastructure Investment and related objectives, it is a set objective that, amongst others, the housing backlog within the province must be eradicated. It is furthermore indicated that, as part of policy alignment with the Spatial Planning Categories, adequate, safe, and affordable housing (amongst other objectives) must be met by 2030.

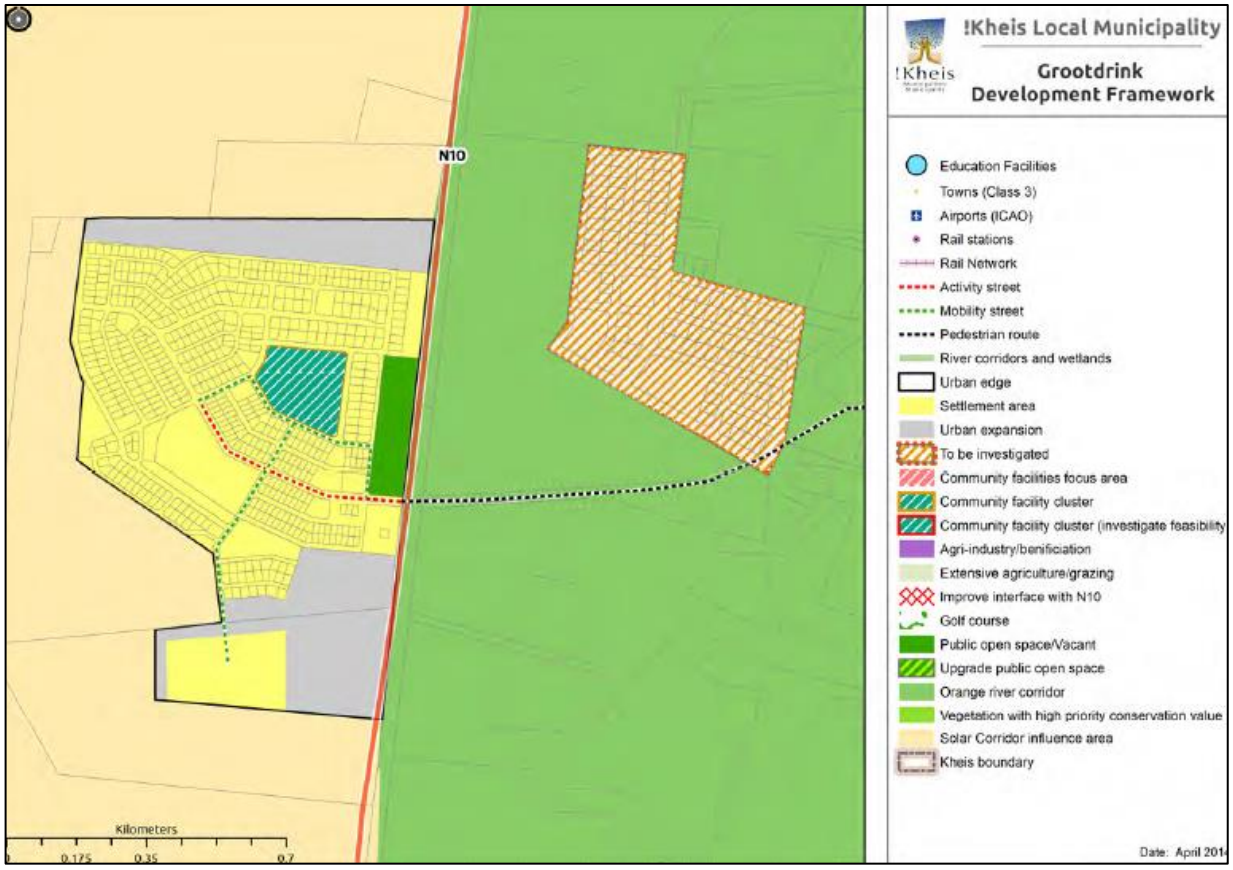


Figure 4. Grootdrink Development Framework. Source: SDF, (2014).

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 measure 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:

9 The development of infrastructure exceeding 1000 metres in length for the bulk transportation of water or storm water;
- (i) with an internal diameter of 0,36 metres or more; or
- (ii) with a peak throughput of 120 litres per second or more;

excluding where;
- a) such infrastructure is for bulk transportation of water or storm water or storm water drainage inside a road reserve or railway line reserve; or
- b) where such development will occur within an urban area.

10 The development and related operation of infrastructure exceeding 1000 metres in length for the bulk transportation of sewage, effluent, process water, waste water, return water, industrial discharge or slimes
- (i) with an internal diameter of 0,36 metres or more; or
- (ii) with a peak throughput of 120 litres per second or more;

excluding where;

(c) such infrastructure is for the bulk transportation of sewage, effluent, process water, waste water, return water, industrial discharge or slimes inside a road reserve or railway line reserve; or

(d) where such development will occur within an urban area.

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;

The environmental process is being undertaken in distinct phases, refer to **Figure 5**. An Application Form has been submitted to Department of Environment and Nature Conservation (DE&NC). On acknowledgment from DE&NC (**Appendix 1A**), the Scoping Process was undertaken to identify potential issues. The Final Scoping Report and Plan of Study for EIA were submitted to the Department of Environment and Nature Conservation (DE&NC). The Scoping Report and Plan of Study for EIA were approved by DE&NC and EnviroAfrica was advised to proceed with the EIA process (**Appendix 1B**).

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 housing, 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 housing, 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 have been recommended by the various specialist assessment, and are 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) – *the EMP is included in the EIR as Appendix 9*.
- 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 *– potential negative impacts have been identified and considered, and any further potential impacts will be identified during the public participation process. Mitigation measures have been recommended by the various specialist assessment, and are included in the EMP*.
- The interests, needs and values of all interested and affected parties will be taken into account in any decisions through the Public Participation Process – *refer to Section 7.4 below and Appendix 3*.
- The social, economic and environmental impacts of the activity will be considered, assessed and evaluated, including the disadvantages and benefits - *refer to Section 10 below*
- 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.

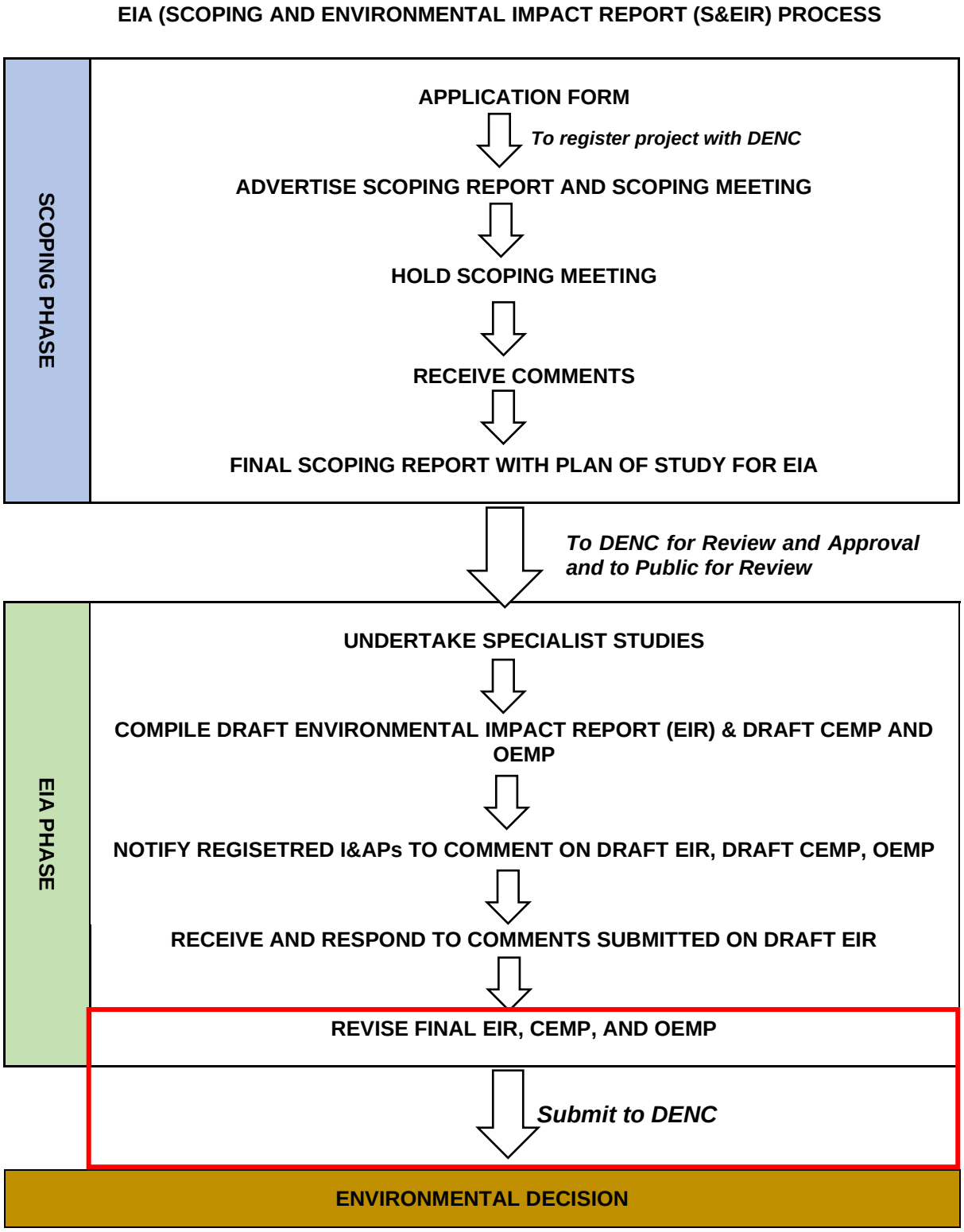


Figure 5: The EIA Process. Currently, this process is in the 'EIA Phase – Revise Final EIR, CEMP and OEMP', as outlined in red.

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*

In accordance with the NHA, a Heritage Impact Assessment (**Appendix 4B**) was undertaken.

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 Affairs, who administer that Act, will be a leading role-player in the EIA.

According to the Freshwater Impact Assessment (**Appendix 4C**), the NWA guides the management of water in South Africa as a common resource. The Act aims to regulate the use of water and activities (as defined in Part 4, Section 21 of the NWA), which may impact on water resources through the categorisation of 'listed water uses' encompassing water abstraction and flow attenuation within catchments as well as the potential contamination of water resources, where the DWS is the administering body in this regard.

Defined water use activities require the approval of DWS in the form of a General Authorisation or Water Use Licence authorisation. Government Notice No. 665 of 6 September 2013 provides for General Authorisations for certain specified water use activities in terms of the disposal of wastewater which then do not require a licensing process. There are restrictions on the extent and scale of listed activities for which General Authorisations apply.

Section 22(3) of the National Water Act allows for a responsible authority (DWS) to dispense with the requirement for a Water Use Licence if it is satisfied that the purpose of the Act will be met by the grant of a licence, permit or authorisation under any other law.

Potential water use activities that are of relevance to the proposed Housing Development are:

- Section 21(c): Impeding or diverting the flow of water in a watercourse;
- Section 21(f): Discharge of waste or water containing waste into a water resource through a pipe, canal, sewer or other conduit;
- Section 21(g): Disposing of waste in a manner which may detrimentally impact on a water resource; and
- Section 21(i): Altering the bed, banks, course or characteristics of a watercourse.

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) posses, 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 20011, 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.

3.8 SPATIAL PLANNING AND LAND USE MANAGEMENT ACT, ACT 16 OF 2013

The Spatial Planning and Land Use Management Act 16 of 2013 (**SPLUMA**) is a national law that was passed by Parliament in 2013. SPLUMA provides a framework for spatial planning and land use management in South Africa.

Please note that a SPLUMA Application (**Appendix 4A**) has been submitted.

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. Consideration of the Northern Cape Provincial Development Spatial Development Framework and the Northern Cape Provincial Growth and Development Strategy has been taken.

4. 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. The current surrounding land use, namely the Grootdrink Settlement, is in line with the nature of the proposed development. The construction of the proposed housing development in another location would increase the construction footprint and therefore, the impact on the environment.

Four (4) layout alternatives were proposed and have been considered during the EIR phase and these are described below:

Alternative 1
Alternative 1 (**Appendix 2A**) is the first of 4 (four) layouts initially proposed. This layout included 370 erven, with an extent of 36ha, which included:

- Residential Zone I – 370 units
- Public Open Space – three (3) units;
- Public roads

This alternative was considered a viable option as it provided a sufficient number of housing opportunities. It was initially the municipalities preferred layout however, due to existing services and infrastructure, as well as identified environmental sensitive areas subsequent to the drawing of this concept layout, this layout needed to be amendment (see Alternative 2 below).

Alternative 2
Alternative 2 (**Appendix 2B**) is the second of four (4) layouts initially proposed. This layout included 373 erven, over an extent of 36ha, which included:

- Residential Zone I - 373units where units will not be constructed in the south-western section of the Grootdrink development footprint,
- Institutional Zone I – three (3);
- Public Open Space – eight (8)

This alternative was considered a viable option as it provided a sufficient number of housing opportunities as well as incorporating the identified high voltage powerlines. However, this layout did not account for various environmental sensitivities (identified subsequent to this concept layout) within the development footprint as well as required open space to ensure a buffer is placed around areas identified as environmentally sensitive. Therefore, this layout needed to be amendment (see Alternative 3 below).

Alternative 3
Alternative 3 (**Appendix 2C**) is the third of four (4) layouts proposed. This layout included 370 erven, over an extent of 36ha, which included:

- Residential Zone I – 370 units
- Business Zone I – three (3) units
- Open Space Zone II – seventeen (17) units
- Institutional Zone I – one (1) unit
- Institutional Zone II – three (3) units
- Authority Zone I – one (1) unit

This alternative was considered a viable option as it provided a sufficient number of housing opportunities and accounted for sensitive areas (namely the watercourses identified), however transport zoning (forming part of the associated infrastructure) was not included. Therefore, this layout needed to be amendment (see Alternative 4 – preferred layout below).

Alternative 4 (Preferred Layout)
Alternative 4 (**Appendix 2D – Preferred Layout)** was the final concept layout proposed and is the Applicant's Preferred Layout. This layout includes 370 erven, over a 36ha extent:

According to the SPLUMA Application Report (**Appendix 4A**), the erven are broken down as follows:

- 370 x Residential Zone I units: dwelling house/ residential house containing 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;
- 3 x Business Zone I: business building / premises which will be used as shops and/or offices (e.g. professional offices, places of assembly, doctors consulting rooms);
- 1 x Institutional Zone I: Place of Instruction / Education
- 3 x Institutional Zone II: place of worship (e.g. places for practising religion);
- 11 x Open Space II: public open space to be utilized by the public as an open space, park, garden, playground, or recreational site;
- 1 x Transport Zone I: public street reserved for street purposes and includes facilities for public transport;
- 1 x Authority Zone I: land/ erven and buildings utilized by local and district municipality to carry out mandatory functions.
- 8 x Undetermined Zones: Referred to properties previously zoned 'undetermined' or other abolished zones in previous schemes which cannot be appropriately converted to a new use zone;

Alternative 4 is similar to Alternative 3, and was developed with amendments to Alternative 1 and Alternative 2 due to new information from the specialists and municipal infrastructure departments in relation to existing services infrastructure and environmental sensitive areas that had a considerable impact on the layout and requirements for additional land uses/ changes to proposed land uses by the local municipality and specific spacing of these land uses. This alternative is also considered as a viable option and is also the municipality's preferred layout since it provides sufficient erven and housing opportunities (370 units x residential zone I) as well as providing for Municipal and Government land use opportunities, more Open Space and sufficient buffer zones recommended by the Botanical, Heritage, and Freshwater specialists.

4.1 OTHER ALTERNATIVES

Site Alternatives

The proposed site is the only viable site available and is in line with surrounding land use (namely the existing Grootdrink Settlement located adjacent to the proposed site for development). Housing is a constant need in the municipality, with other sites possibly earmarked for residential development that will not form part of this application. The construction of the proposed housing development in another location would increase the construction footprint and therefore, the impact on the environment.

Activity Alternatives

Activity alternatives are also 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.

4.2 NO-GO ALTERNATIVE

This is the option of not developing the proposed housing development.

Although the no-go development might result in no potential negative environmental impacts, the direct and indirect socio-economic benefits (such as housing shortages as well as loss of potential employment and skills-development opportunities) of not constructing the residential development will not be realised. Informal housing may increase where the location of such housing may negatively impact the environment and/or health and safety of members. For example, informal households built in close proximity to drainage lines may increase the erosion potential of the immediate area, directly impacting the receiving environment and structural integrity of the informal household[5]. Moreover, the increase in the construction of informal households may compromise any future formalization and development plans. The need for additional housing opportunities in the !Kheis Local Municipality will not be realised. As described in *Section 2.1*, the population in Grootdrink is predicted to increase. As per the Engineer's Service Report (Appendix 4B), the state of the water and sewerage services associated with the Grootdrink Settlement does not have the capacity to service the current population within the development. Households within the existing Grootdrink Settlement is currently serviced by conservancy tanks or VIP toilets and no waterborne sewer systems are present to service sewage produced. The conservancy tanks are currently emptied by a honey sucker truck and spilled in an oxidation pond system (which are in poor condition) to the west of the existing Settlement. The lack of adequate housing and employment opportunities may result in community members leaving the area and moving to Grootdrink, increasing pressure on an already financially- and services-constrained town. Due to the failing wastewater treatment works (WWTW), the no-go option will also result in continual pollution and health risks, coupled with huge maintenance costs. In addition, the predicted population increase will result in the need to effectively service the production of sewage and thus, the need for a full-borne sewerage system.

[5] Satterthwaite, D., Archer, D., Colenbrander, S., Dodman, D., Hardoy, J., Mitlin, D. and Patel, S., 2020. Building resilience to climate change in informal settlements. *One Earth*, 2(2), pp.143-156.

5. SITE DESCRIPTION

5.1 LOCATION

The proposed site is located approximately 12km east of Grootdrink, west of the N10 and the Orange River, and is situated within Ward 2 of the !Kheis Local Municipality, ZF Mgcawu District Municipality, Northern Cape. The proposed site is located at the following location: 28°33'46.40"S; 21°44'28.45"E.

According to the Botanical Report (Appendix 6A), the site includes various areas already degraded or disturbed, and also comprises of a number of illegal dumping sites. Overall, the proposed site for development is comprised of approximately 12ha of areas already settled/ currently being settled and approximately 4.7ha of general disturbance (including excavations and dumping) (Figure 6).

Figure 6. Disturbed areas associated with the proposed site for development. Source: Botanical Impact Assessment (Appendix 6A).

Figure 7. Overview of site looking south-west over the site. Please refer to Appendix B for more site photographs.

Figure 7. Overview of site looking south-east over the site. Please refer to Appendix B for more site photographs.

Table 1. Coordinates of corner points of the Grootdrink study area

	Point	Latitude (S) (DDMMSS)			Longitude (E) (DDMMSS)		
Coordinates of corner points of study area (if there are more than 7 co-ordinates, please attach a list as **Appendix 4**) For linear developments a list of turning points must be attached	**1**	28°	33'	28.88"	21°	44'	33.20"
	2	28°	33'	29.04"	21°	45'	1.90"
	3	28°	33'	33.22"	21°	45'	1.59"
	4	28°	33'	31.58"	21°	44'	44.69"
	5	28°	33'	32.40"	21°	44'	43.00"
	6	28°	33'	31.70"	21°	44'	42.24"
	7	28°	33'	31.32"	21°	44'	41.01"
	8	28°	33'	30.73"	21°	44'	34.95"
	9	28°	33'	38.70"	21°	44'	34.04"
	10	28°	33'	41.58"	21°	44'	34.85"
	11	28°	33'	46.32"	21°	44'	37.44"
	12	28°	33'	47.07"	21°	44'	35.66"
	13	28°	33'	47.53"	21°	44'	35.56"
	14	28°	33'	49.56"	21°	44'	35.96"
	15	28°	33'	54.49"	21°	44'	43.24"
	16	28°	33'	55.53"	21°	44'	45.51"
	17	28°	33'	59.78"	21°	44'	46.00"
	18	28°	33'	59.45"	21°	44'	49.87"
	19	28°	33'	59.83"	21°	44'	51.30"
	20	28°	33'	57.41"	21°	44'	52.17"
	21	28°	33'	58.73"	21°	44'	54.35"
	22	28°	34'	0.13"	21°	44'	57.68"
	23	28°	34'	0.66"	21°	44'	57.76"
	24	28°	34'	2.50"	21°	44'	37.19"
	25	28°	33'	54.98"	21°	44'	34.03"
	26	28°	33'	48.11"	21°	44'	23.49"
	27	28°	33'	33.46"	21°	44'	24.44"
	28	28°33'	33'	31.55"	21°	44'	26.86"
	29	28°33'	33'	31.59"	21°	44'	32.39"

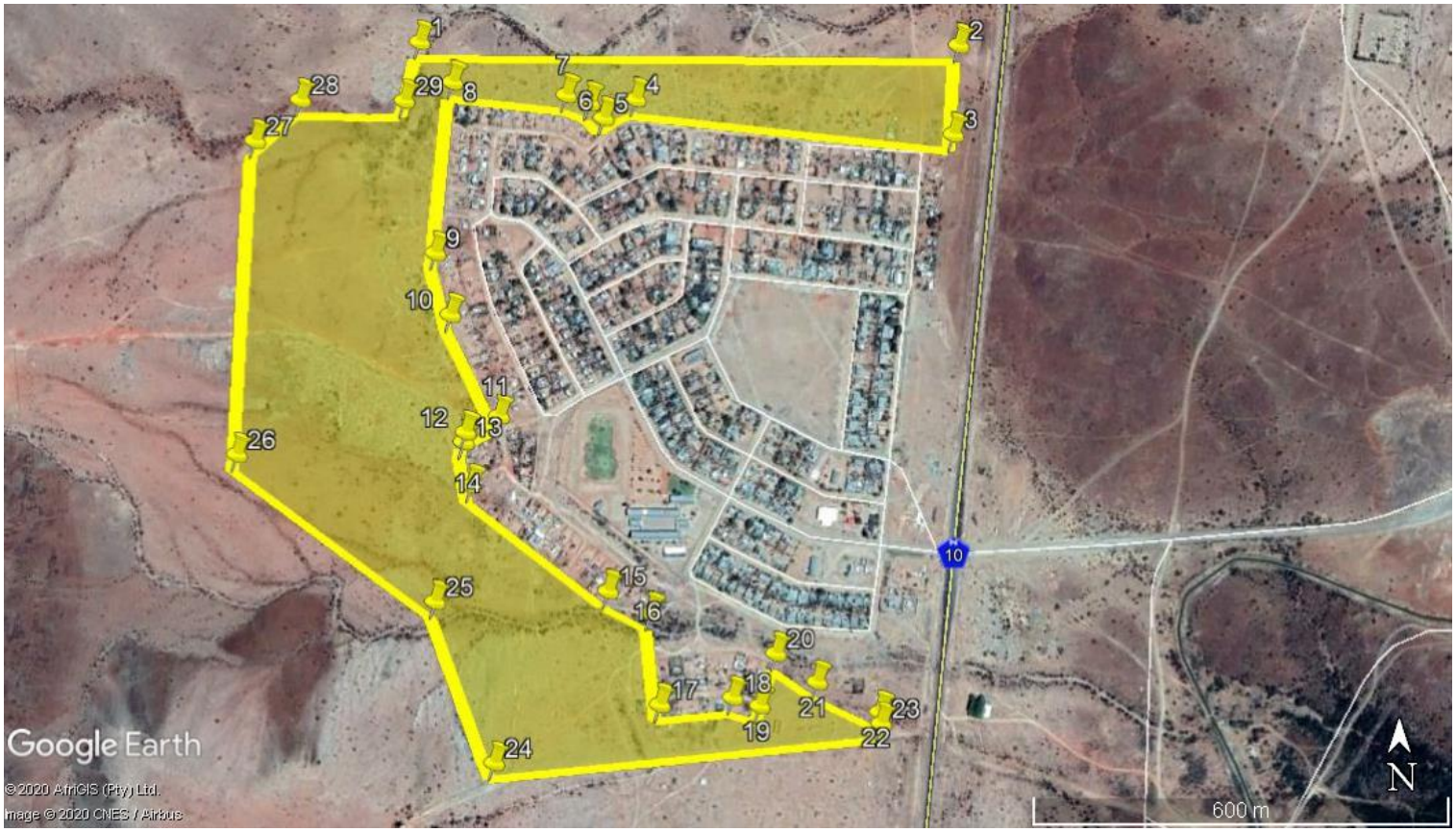


Figure 8. Map referring to GPS co-ordinates in Table 1.

Figure 9. Overview of site looking south-east over the site.

Figure 10. Overview of site looking in a south-east over the site. Note existing electrical supply (red arrow).

Figure 11. Overview of site looking south over the site. Note, one of numerous incidences of illegal dumping (general and hazardous waste).

Figure 12. Overview of site looking west over the site. Note, one of numerous incidences of illegal dumping (general and hazardous waste).

Figure 13. Overview of site looking north over the site.

Figure 14. Overview of site north-west over the site. Note, one of numerous incidences of illegal dumping (general and hazardous waste).

5.2 VEGETATION

According to the Vegetation map of South Africa, Lesotho and Swaziland (Mucina & Rutherford, 2006) only one broad vegetation type is expected on the majority of the proposed site, namely Bushmanland Arid Grassland (Least Threatened). The Lower Gariep Alluvial Vegetation type, located east of the proposed site for development, is an Endangered ecosystem type associated with the Orange River (Figure 15).

The Bushmanland Arid Grassland vegetation type is distributed throughout the Northern Cape Province, spanning about one degree of latitude from around Aggeneys in the west to Prieska in the east. The southern border of the unit is formed by edges of the Bushmanland Basin while in the northwest this vegetation unit borders on desert vegetation (northwest of Aggeneys and Pofadder). The northern border (in the vicinity of Upington) and the eastern border (between Upington and Prieska) are formed with often intermingling units of Lower Gariep Broken Veld, Kalahari Karroid Shrubland and Gordonia Duneveld. Most of the western border is formed by the edge of the Namaqualand hills. The altitude throughout this vegetation type ranges from 600–1 200 m[6].

The vegetation component comprises of extensive-to-irregular plains on a slightly sloping plateau sparsely vegetated by grassland dominated by white grasses (*Stipagrostis* spp) giving this vegetation type the character of semidesert 'steppe'. In certain places, low shrubs of *Salsola* change the vegetation structure. In years of abundant rainfall rich displays of annual herbs can be expected. From a conservation perspective, the vegetation type is categorized as Least Threatened (LT) with a conservation target of 21%. Only small patches statutorily conserved in Augrabies Falls National Park and Goegab Nature Reserve. Very little of the area has been transformed. Erosion is very low (60%) and low (33%)[2].

[6] Mucina and Rutherford, (2006). The Vegetation of South Africa, Lesotho and Swaziland. *Strelitzia*, 19.

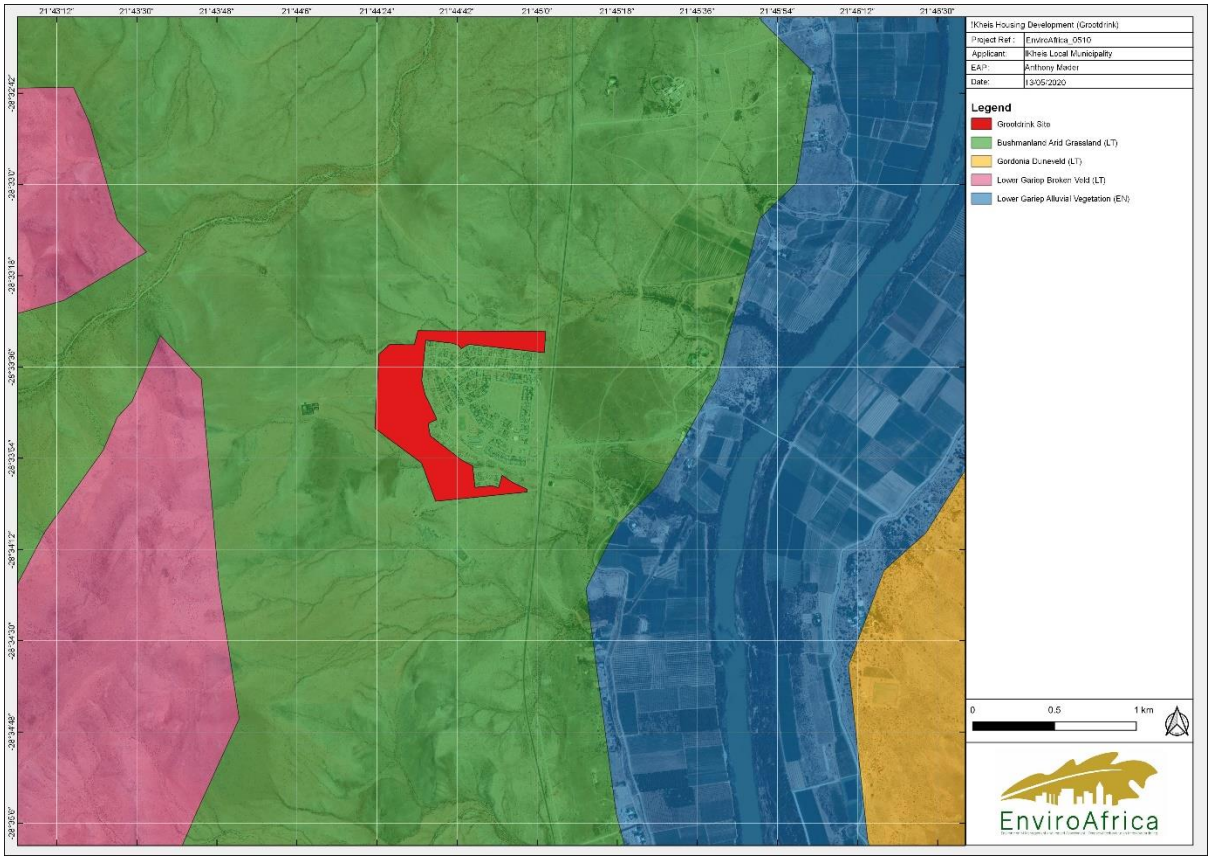


Figure 15: Vegetation types associated with the proposed Grootdrink Housing development. Source: QGIS, version 3.10.

The remaining natural veld was covered by a low sparse to very sparse shrubland, typically found in the Bushmanland Arid Grassland vegetation type on shallow soils on weathering rock dominated by quartz and calcrete. Although the Northern Cape are in the midst of a severe drought (the last 5 – 7 yeas), recent rains had brought some relieve, which can be seen in the display of grasses and the new growth shown by many a plant (although it had not as yet trigger a display of annual or herbaceous species). Although grasses were common, they were not as conspicuous as expected (especially after some rains). This is most probably an attribute of intensive grazing by livestock of the local people. The effect of grazing is also visible through most of the veld, with most plants reduced to small or dwarf shrubs as a result of grazing and species restricted to the hardy unpalatable plant kind.

As per the Botanical Assessment, vegetation encountered during the site visit varied from lowly sparse-to-very sparse shrubland, dominated by *Tetraena decumbens,* whereas *Justicia australis* (=*Monechma*) and *Aptosimum spinescens* are also common. The following plants were also observe, scattered throughout the footprint: *Adenium cf. oleifolium, Aizoon burchellii* (common*), Aloe claviflora* (very common), *Asparagus* species, *Atriplex lindleyi, Blepharis mitrata, Boscia albitrunca* (occasionally*), B. foetida* (occasionally), *Cynanchum viminale, Eriocephalus* species, *Euphorbia gariepina*, *Euphorbia braunsii* (occasionally), *Geigeria ornativa, Kleinia longiflora, Leucosphaera bainesii* (occasionally), *Rogeria longiflora, Salsola zeyheri, Tetraena microcarpa* (occasionally), *Tetraena rigida* and *Tribulus cf. zeyheri*. The invasive alien *Prosopis* tree was also occasionally observed.

The larger ephemeral drainage lines on the other hand were clearly marked by a denser and larger stand of vegetation, dominated almost exclusively by *Senegalia mellifera* (with the parasitic *Tapinanthus oleifolius* often observed on the tree). Other species encountered in these drainage lines includes larger shrubs like *Cynanchum viminale, Lycium cinereum*, *Phaeoptilum spinosum*, *Rhigozum trichotomum* and smaller trees like *Parkinsonia africana* as well as *Ziziphus mucronata* (medium sized tree). *Boscia albitrunca* (the most significant botanical feature) were also often observed near or within these drainage lines.

According to the Northern Cape Critical Biodiversity Area (CBA) map (Figure 16), the proposed development falls within a terrestrial CBA. However, as per the Botanical Specialist, there is no real alternative site within the Municipal town boundaries that is not located within the CBA.

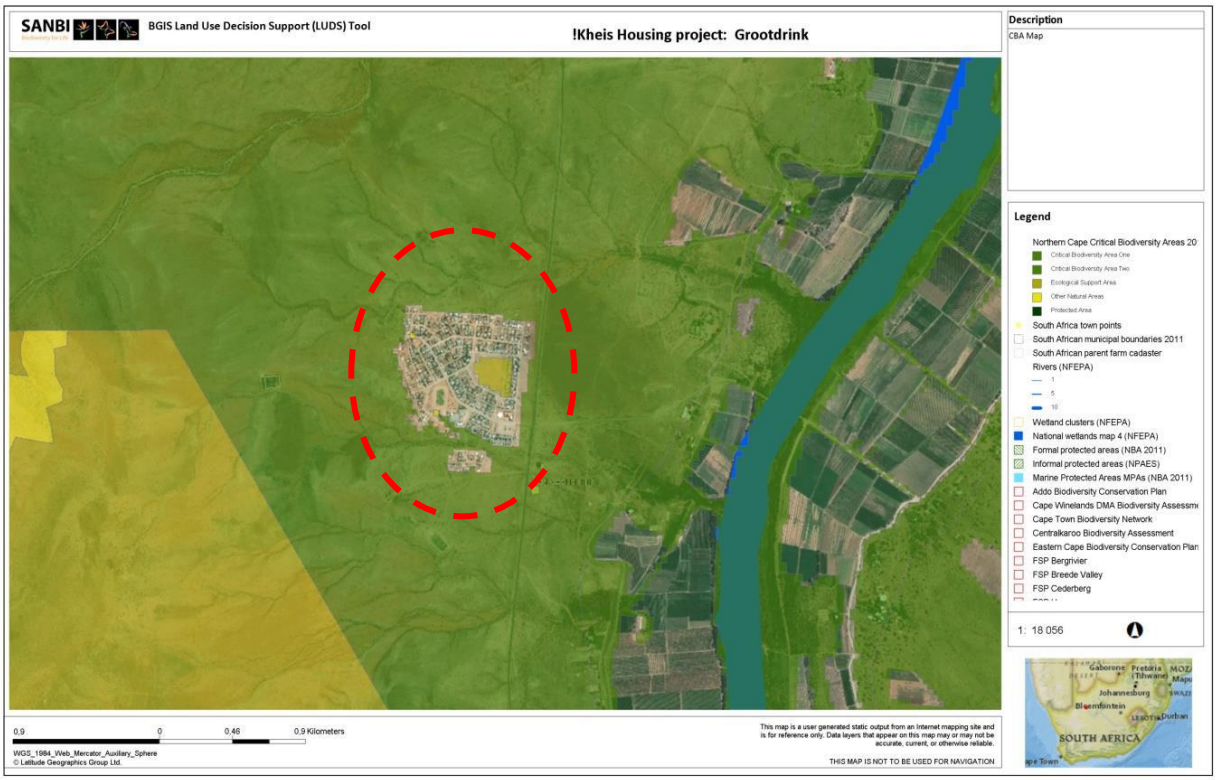


Figure 16: The proposed site for development is located within a Critical Biodiversity Area (CBA). Location of site is encircled in red.

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.

5.3 FRESHWATER

According to the Freshwater Assessment (**Appendix 6C**), the drainage lines are mostly dry, with water only during rains and perhaps shortly thereafter. During the infrequent rainfall events, 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. Two small sub-catchments can be distinguished around the township of Grootdrink. The one to the north is 283 ha, with a circumference of 7.4km. The one to the south is 174 ha with a circumference of 6.5ha. Most of the existing Grootdrink is on a flat piece of land in between these two sub-catchments. This land is without a discernible drainage line. To the north of Grootdrink, a well-defined and much larger drainage line. This does not have any bearing on Grootdrink. The two confluences with the Orange River are relatively natural, if compared to some of the other heavily canalised ones. The drainage lines are small, but despite of their size, they have large culverts underneath the N10 trunk road. There is a smaller one in between, just four concrete pipes underneath the road. The drainage line in sub-catchment 1 will be just touching on the boundary of the new development. If a buffer zone of 32m is to be maintained, it would contribute much towards meeting the legal requirements. If this would take away too much from the available land for development, a decrease of the buffer zone of 15m or 20m can be motivated for. The drainage line in sub-catchment 2 would pass right through the new development. A strip of land of 50m wide should be left open around the drainage line. Since these drainage lines are small, formalised drainage canals, straightened and clad with concrete, won't be necessary, as the flood risks are seemingly negligible. Large quantities of household solid waste were noticed along Grootdrink's main street as well as in the drainage lines.

According to the Botanical Impact Assessment (Appendix 6A), the larger ephemeral drainage lines on the other hand were clearly marked by a denser and larger stand of vegetation, dominated almost exclusively by *Senegalia mellifera* (with the parasitic *Tapinanthus oleifolius* often observed on the tree). Other species encountered in these drainage lines includes larger shrubs like *Cynanchum viminale, Lycium cinereum, Phaeoptilum spinosum, Rhigozum trichotomum* and smaller trees like *Parkinsonia africana* as well as *Ziziphus mucronata (*medium sized tree). *Boscia albitrunca* were also often observed near or within these drainage lines.

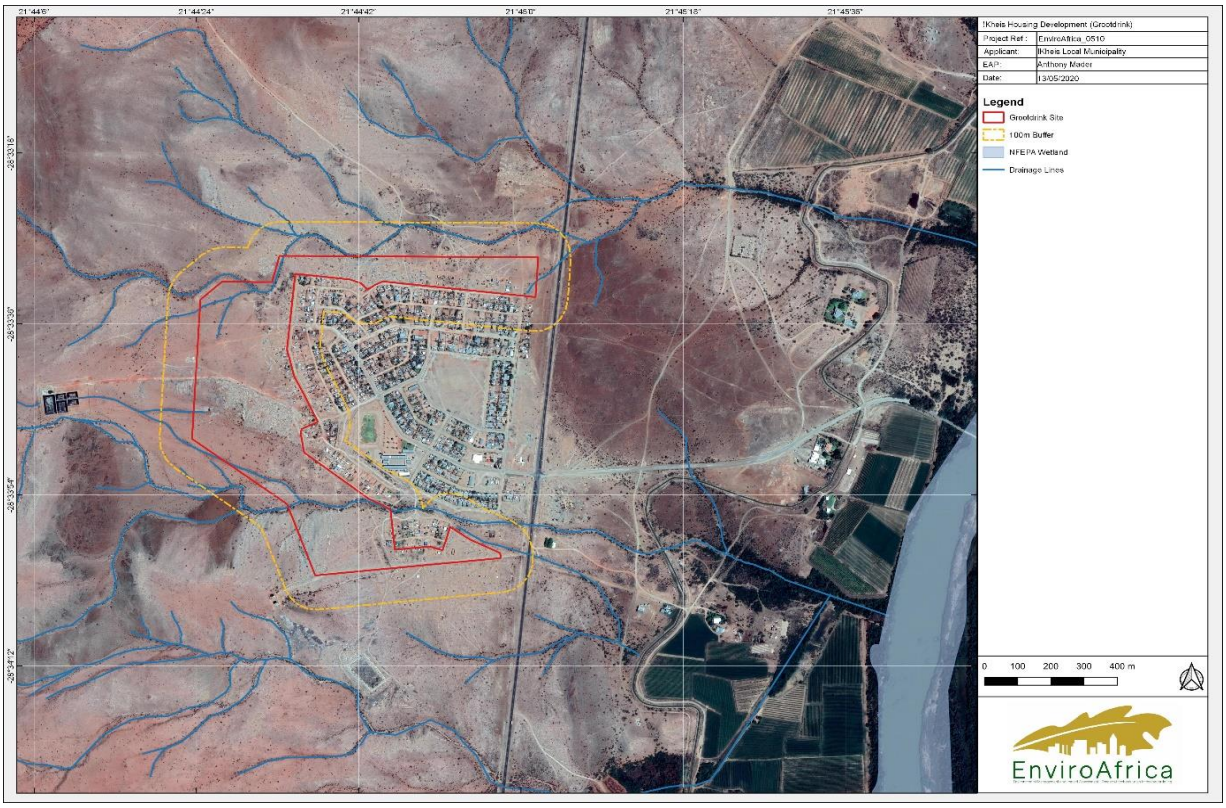


Figure 17: Watercourses associated with the proposed site for development. Source: Freshwater Impact Assessment (Appendix 6C).

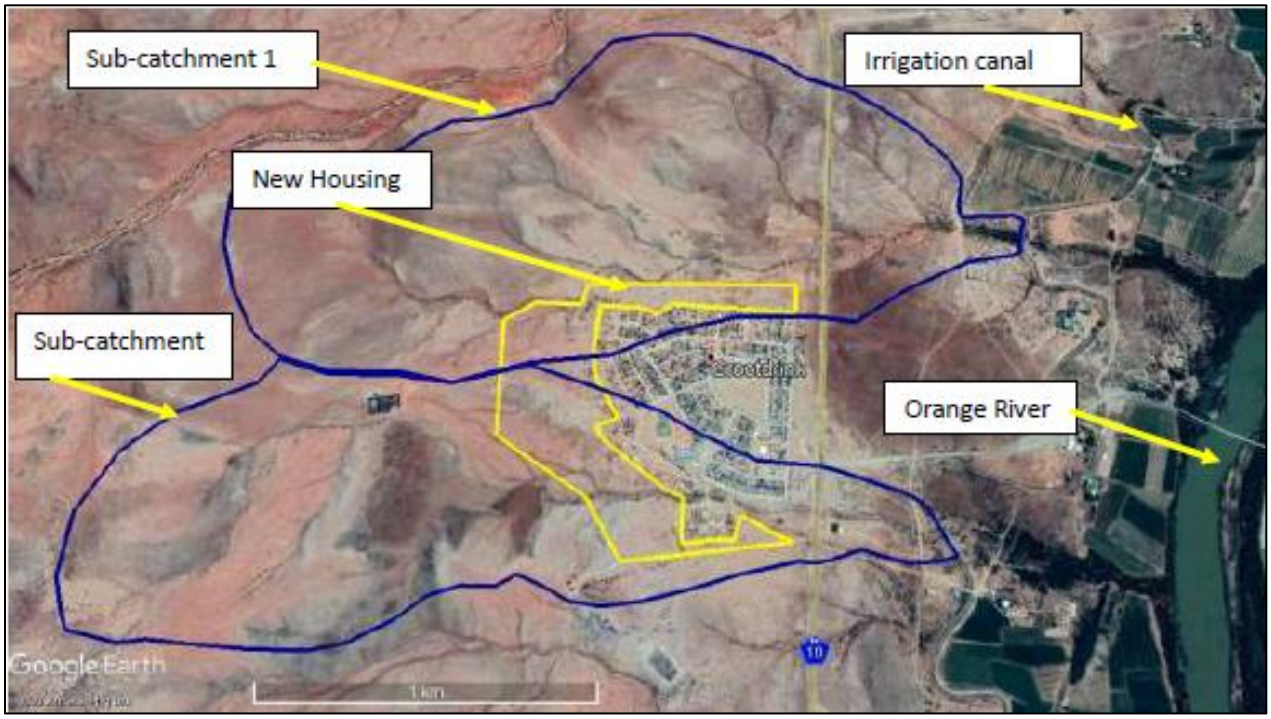


Figure 18: Sub-catchments associated with drainage lines present within the proposed site for development. Source: Freshwater Impact Assessment (Appendix 6C).

5.4 GEOLOGY

Bedrock present includes lower basalts of the Leerkrans Formation, Wilgenhoutsdrift Group and can be described as consisting of greenstone and green-schist. Volcanic features are present as metabasalt and felsic lava. Discontinuities in the basalt are open and filled with sand.

Soil Profile:
The soil profile of the site is comprised of colluvium (consisting of pegmatitic gravels, weather resistant scree of quartz and quartzite fragments contained in a sandy matrix where nodules of calcrete may be contained), residual basalt (underlies the colluvium tending to be highly weathered, medium hard rock where calcification of the residual soil may occur), residual green-schist (underlying nodular calcrete supported by gravels of green-schist), fill (substantial areas of stockpiled rubble are present throughout the site where rubble consists of household waste, excavated calcrete and builder's rubble), Mokalanen Formation [hardpan calcrete (underlying colluvium which is very fine grained and very dense) , nodular calcrete (consisting of boulder calcrete underlying the colluvium directly as pure pedocrete to a sub-horizon of residual soil or as an extensively calcified and nodular horizon).

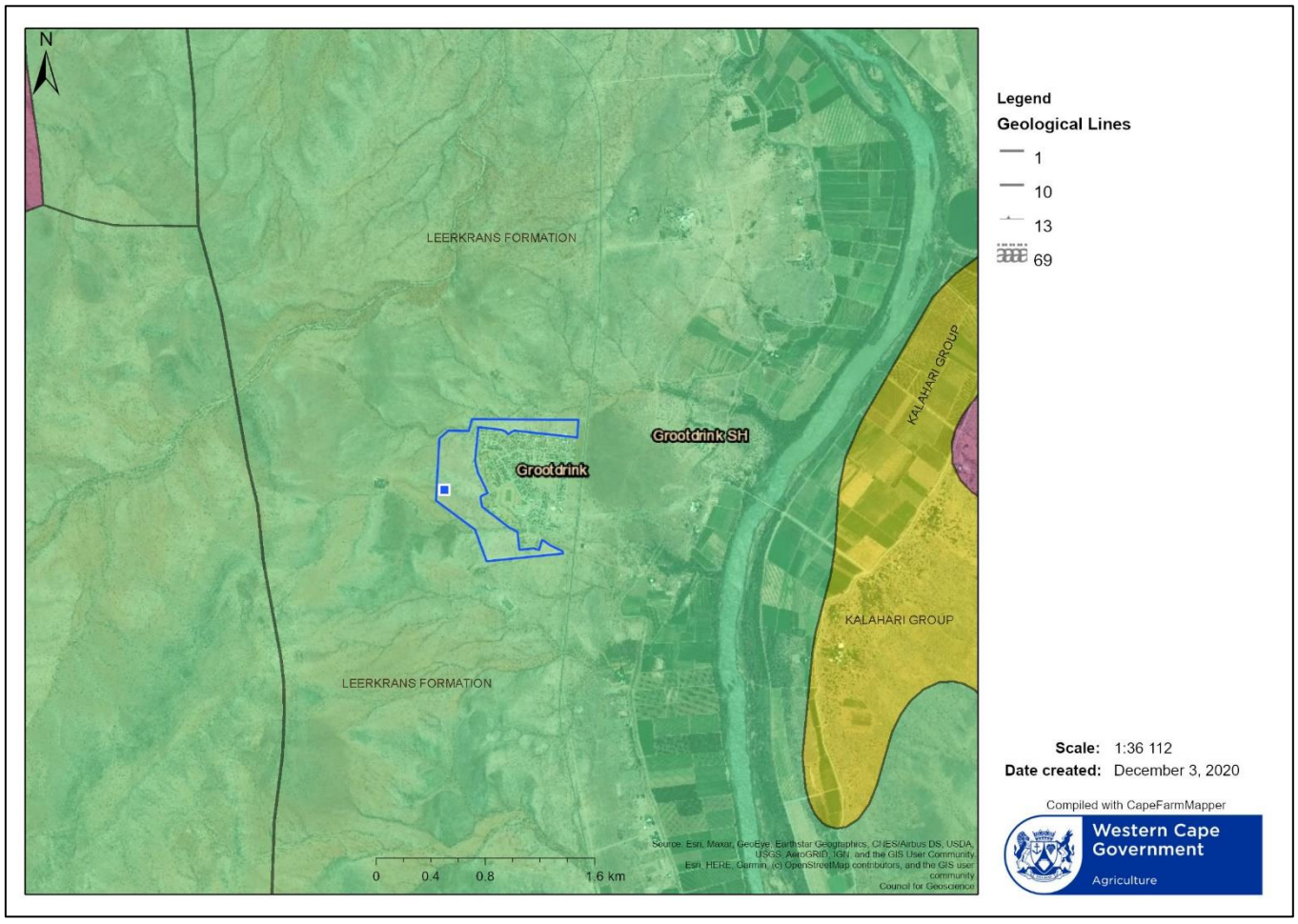


Figure 19. Geological features associated with the Grootdrink site.

5.5 GEOHYDROLOGY

According to the Geo-technical Assessment (**Appendix 6D**), No perched groundwater was encountered on site during the geotechnical investigation (and is not anticipated to be problematic on site). Groundwater is expected to occur at depths less than 15m within compact, argillaceous strata. Successful drilling for water within the proposed site for development is expected to be between 40 – 60% whereas the drilling for a borehole yielding at least 2l/s ranges between 10 – 20%.

5.6 CLIMATE

Rainfall largely in late summer/early autumn (major peak) and very variable from year to year. MAP ranges from about 70 mm in the west to 200 mm in the east. Mean maximum and minimum monthly temperatures for Kenhardt are 40.6°C and –3.7°C for January and July respectively. Corresponding values for Pofadder are 38.3°C and –0.6°C. Frost incidence ranges from around 10 frost days per year in the northwest to about 35 days in the east. Whirl winds are common on hot summer days[7].

5.7 SOCIO-ECONOMIC CONTEXT

!Kheis Local Municipality

According to the !Kheis Municipality Integrated Development Plan (IDP 2019 – 2022), !Kheis municipality the population of Kheis increased by 1 520 people, from 15 046 people in 1996 to 16 566 people in 2016.

The total number of households in Kheis municipality increased over the period from 1996 to 2016, from 3 206 households to 4 344 households respectively. This shows an increase in the number of two-person households, from 565 households in 1996 to 823 households in 2016. There is a reduction in the number of households with 10 persons and above. Two-person households increased from 17.6% in 1996 to 18.9% in 2016, this is followed by three-person households at 17.8% of the total number of households in Kheis. There was an improvement in the level of education in Kheis over the period 1996 to 2016, where there was a decline in the percentage of people aged 20 years and above with no schooling from 26.8% in 1996 to 11.7% in 2016. There is also an increase observed in the percentage of people having a matric qualification over the period from 1996 to 2016 from 6.6% to 18.0.

According to the !Kheis Municipality IDP (2019 – 2022), 20.8% of the households in Kheis reported a lack of safe and reliable water supply as being the major difficulty facing the municipality, with 11.2% reporting that inadequate housing is a problem in the municipality. Approximately 9.8% was reported inadequate sanitation/sewerage/toilet services. There was a decrease in the proportion of households staying in formal dwellings in Kheis. Households occupying formal dwellings decreased by 15.7% from 75.0% in 1996 to 59.3 in 2016. An increase is observed in the proportion of informal dwellings, from 13.4% in 1996 to 16.5% in 2016. The proportion of traditional dwellings shows an increase over this period. There was an increase of 8.7% in the proportion of dwellings owned by households in Kheis, from 38.3% in 2001 to 47.0% in 2016. There is a decline in the proportion of households that are occupied rent-free, from 49.6% in 2001 to 7.5% in 2016.There was an increase in the proportion of households in Kheis whose refuse is removed by a local authority at least once a week, from 48.1% in 1996 to 62.0% in 2016.There was an increase in the proportion of households that have no rubbish disposal from 1.6% in 1996 to 7.6% in 2016

[7] Mucina and Rutherford, (2006). The Vegetation of South Africa, Lesotho and Swaziland, *Strelitzia 19*

According to the !Kheis Municipality IDP (2019 – 2022), there was a decrease in the proportion of households that that use a flush or chemical toilet in Kheis, from 45.3% in 1996 to 45.1% in 2016. There is an increase in the proportion of households using a pit latrine toilet, and a significant decrease in the proportion of households that use a bucket latrine, from 8.1% in 1996 to 1.8% in 2016. According to the !Kheis Municipality IDP (2019 – 2022), the employment rate in !Kheis municipal area has dramatically increased from 50% to 60% high from 1996 – 2001 and took a dip from 60% - 59% from 2002 - 2014 and that the unemployment rate has also increase in 1996 – 2003 from 18% - 21%, but remained constant at 21% from 2004 – 2007 and took a massive increase from 2008 – 2014 from 21% – 32% due to exporting in the agriculture industry.

According to the !Kheis Municipality IDP (2019 – 2022), the reason why the unemployment rate is above 20% in the !Kheis area is caused by the fact that only a very small percentage of people are highly skilled and are currently attending any tertiary education at higher institutions and the seasonal economic activities taking place in the agriculture sector which has a direct impact on the skills development levels and employment rate in the area.

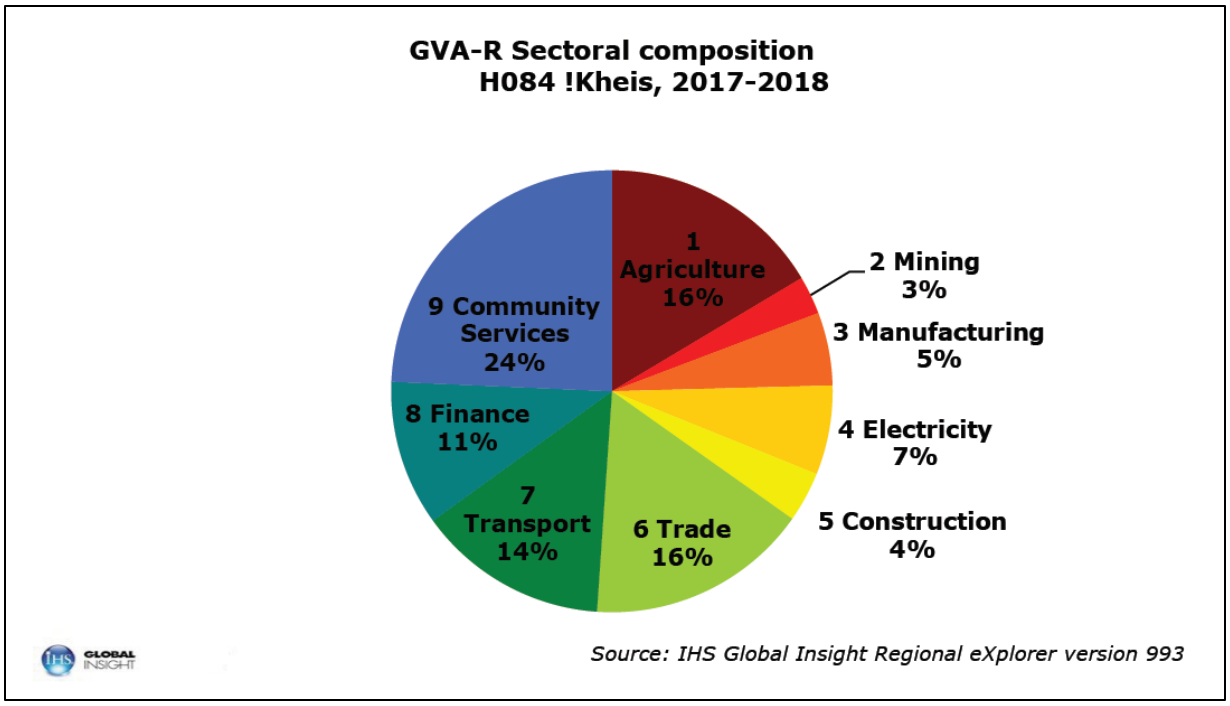


Figure 20: Sectoral composition !Kheis (2017-2018)(Source !Kheis Municipality IDP (2019 – 2022)

As per figure 19 above, the highest contributing sector was community services with 24% to the total economy and agriculture being the second highest contributing sector with 16% and the lowest two contributing sectors to the total economy in the area are mining at 3% and construction at 4% in 2015. A large number of residents are dependent on government pensions, implying that a large part of the residents of !Kheis earn less than R 2000.00 per month and that in itself has a negative influence on the payment of services. Livestock is marketed at Grootdrink, Upington, Johannesburg and Cape Town. Cotton, corn, wheat, tomatoes, peanuts, musk melons and pumpkins are cultivated under irrigation from the Orange River. In the irrigation sector, focus is mainly placed on the cultivation of table grapes.

Grootdrink

Refer to Section 2.1.

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 management. As per the Land Development Plan/ Rural Spatial Development Framework (2014), Grootdrink 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 proposed Grootdrink 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 Grootdrink Township. According to the SDF, the population in Grootdrink increased from 2183 (in 2001) to 2645 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 Grootdrink 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%).

The Green Drop Program (DWS incentive regulation) promoting the effective and efficient management of wastewater. As per the Green Drop Report (2010/11), the 71 treatment facilities within the Northern Province receive approximately 93mL/day. Although the total collective hydraulic design capacity of these treatment facilities are 150ML/day, the remaining 38.5% surplus capacity may not be readily available due to inadequate maintenance and operational deficiencies at lower capacity municipalities. The current state of the Grootdrink WWTW may not be amenable to service an increased amount of sewage generated by the expected number of community members who will be benefiting from the construction of the new housing. !Kheis Local Municipality received a Green Drop Score Percentage of 8%, meaning the WWTWs in the Municipality are underperforming and pose a threat to the environment and public health.

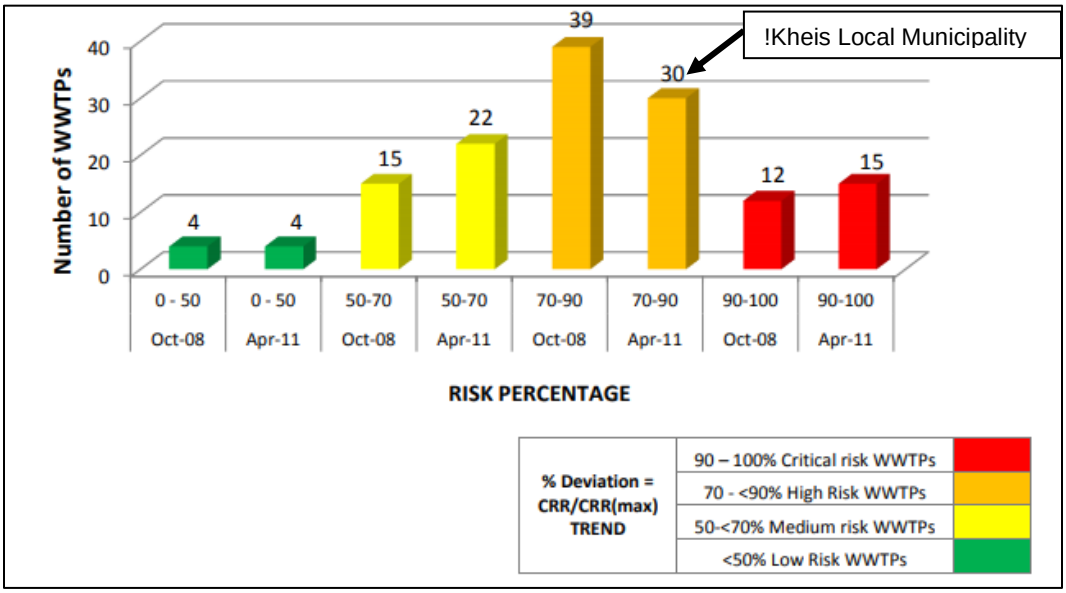


Figure 21. Results of Green Drop Score (2010/11)

The anticipated socio-economic values associated with the proposed project, as provided by the municipality, can be seen in Table 2 below. The development is expected to create approximately 100 employment opportunities, with approximately 85% of that going to previously disadvantaged individuals.

Table 2. Social and Economic Aspect

Anticipated CAPEX value of the project on completion	TBC
What is the expected annual income to be generated by or as a result of the project?	TBC
New skilled employment opportunities created in the construction phase of the project	Construction phase of the project yet to commence. However, it is expected that new skilled employment opportunities will be created for local community during physical construction of infrastructure
New skilled employment opportunities created in the operational phase of the project	None
New un-skilled employment opportunities created in the construction phase of the project	Estimated ±100 employment opportunities
New un-skilled employment opportunities created in the operational phase of the project	None
What is the expected value of the employment opportunities during the operational and construction phase?	± R3 500.00 per employee per month

What percentage of this value that will accrue to previously disadvantaged individuals?	±85%
The expected current value of the employment opportunities during the first 10 years	Unknown at this stage
What percentage of this value that will accrue to previously disadvantaged individuals?	To be confirmed

Although no direct operational job opportunities are expected, indirect job opportunities may be provided with the provision of business zoned properties.

5.8 HERITAGE FEATURES

According to the Heritage Impact Assessment (HIA) (**Appendix 6B**), no heritage resources were identified within the development footprint. Heritage resources, such as lithic material, of low significance were identified and recorded outside the development footprint. Therefore, no heritage resources will be negatively affected by the proposed expansion of the Grootdrink settlement. The Grootdrink cemetery Is located outside the proposed development footprint, graded as IIIB and is classified a high local significance. The site is classified as low-to-moderate palaeontological significance of the area – no further palaeontological heritage studies, ground-truthing, and specialist mitigation measures are required.

The Grootdrink development footprint is underlain by Cenozoic Kalahari Group and the Boom River Formation of the Koras Group. Underlying these rocks are rocks of the Precambrian Transvaal Supergroup. According to the SAHRIS PalaeoMap, the Palaeontological Sensitivity of the Kalahari Group is low whereas the paleontological sensitivity of the Boom River Formation is insignificant whereas the Precambrian Transvaal Supergroup is of moderate sensitivity (Butler 2020).

6. SERVICES

Due to the nature and size of the proposed development, an investigation into the status and availability of existing bulk services to supply the development was needed. Bvi Consulting Engineers compiled a Bulk Services Report (**Appendix 4B**), investigating the status of existing services that were identified to potentially supply the proposed area on the external services for the proposed development.

A brief description of the bulk services is given below. Please refer to the Engineer's Services Report (Appendix 4B) for more information.

6.1 WATER

According to the Engineering Services Investigation Report (prepared by Bvi Engineers, dated August 2020), current water supply and associated infrastructure currently servicing the existing Grootdrink Settlement (Figure 25) comprises of:

- Raw water is pumped from the Orange River pump station to the purification plant, delivering a maximum flow rate of 15l/s through a 750m long, 140mm diameter Class 6 PVC pipeline to a 75m^3 raw water storage dam next to the Water Treatment Works.
- Water is pumped from the raw water storage dam through the Water Treatment Plant (50 00 l/h UFMC water treatment system) to a 530m^3 sectional steel potable water storage reservoir. From there, it is pumped through a 1200m long, 140mm diameter PVC Class 6 potable water supply line to the sectional steel storage reservoir and sectional steel pressure towers.
- The Wastewater Treatment Works consists of a dosing system as well as 50000 l/h UFMC water treatment system
- Potable water is delivered from the elevated storage tank into the reticulation network via a 140mm diameter PVC Class 6 pipeline

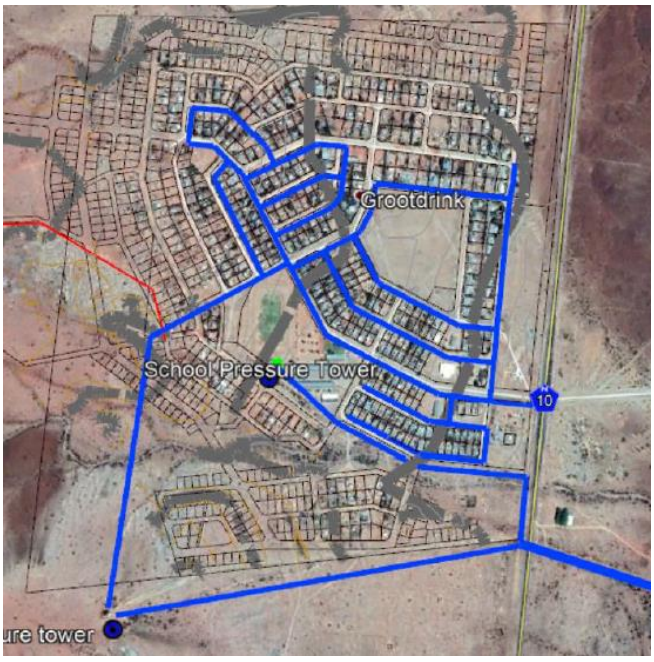


Figure 22. Current water reticulation within the existing Grootdrink Settlement. Source: Engineer's Service Report (Appendix 4B).

- Associated infrastructure has to be manually operated whereas certain equipment such as water meters and pressure gauges are out of order whereas one of the filter pumps were missing at the time of the site investigation.
- Annual Average Daily Demands (AADD) is calculated at 458.7m^3/day.

Bulk water infrastructure requirements are comprised of:

- The expected AADD is calculated at 680.7m^3/day
- Upgrading of the river pump station with a duty and standby pump to supply 15l/s.
- An additional 160mm diameter Class 6 PVC pipeline between the river pump station and the existing potable water storage reservoir.
- Upgraded Water Treatment Works capable of delivering 74m^3/h on the existing treatment works site
- New 360m^3 sectional steel reservoir next to the upgraded water treatment works
- New 350m^3 sectional steel pressure tower on the highest point to the north.
- New 60l/s uplifting pump station at the treatment works.
- New 200mm pipeline between the lifting pump station and the pressure tower.
- New pipeline through the planned extension to create a new ring network.

Figure 23. Graphical representation of required water supply upgrades. Engineer's Service Report (Appendix 4B).

6.2 SEWER

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.

According to the Engineering Services Investigation Report (Appendix 4B), households in the Grootdrink village is currently serviced by conservancy tanks or VIP toilets. There is presently no waterborne sewer system. Conservancy tanks are currently serviced by honey sucker trucks which subsequently pump the sewage into oxidation ponds located west of the proposed site for development. These oxidation ponds are in a poor, non-functioning condition. Moreover, HDPE lining of secondary ponds. The calculated sewer flow per day is 546 000l/day.

Figure 24. Existing sewage infrastructure servicing the existing Grootdrink Settlement. Source: Engineer's Service Report (Appendix 4B).

As such, the proposed upgrades are recommended / required to service the proposed development includes the construction of:

- Two (2) new sewer pump stations capable of delivering 50 l/s direct to the Wastewater Treatment Works (WWTW).
- New 250mm diameter and 160mm diameter Class 6 PVC pipelines (1600m and 1800m, respectively) between the pump stations and upgraded WWTW (oxidation ponds).
- Upgrading the capacity of the WWTW oxidation ponds to a capacity of 0.7Ml per day.

6.3 ROADS

No problems are foreseen regarding roads and access to the development will be from the existing Residential Collector Streets (Class 4b).

6.4 STORMWATER

No formal stormwater infrastructure is present within the Grootdrink settlement where stormwater runoff drains from the centre of the site. According to the Engineering Services Investigation Report, existing roads will be adequate for this purpose. The guiding principle is that the peak stormwater runoff from the site, post construction, should not exceed the full range of storm return periods (1:2 to 1:50) of the site pre-construction. Stormwater infrastructure must be constructed to:

- Accommodate minor storm events (i.e. 1:5 years) in open channels or side drains of streets;
- Accommodate major storm events (i.e. 1:50 year) through controlled overland flows, aboveground attenuation storage, and berms at the higher end of the site; and
- Infrastructure must be constructed to prevent pooling of stormwater runoff;
- Existing roads will be adequate for stormwater management.

In addition to parameters stipulated above, a Stormwater Management Plan (SWMP) must be designed and compiled to address concerns raised by the I&AP - namely the potential flow of sewage- and/or solid waste-contaminated stormwater runoff from the development into the drainage lines and subsequently the Orange River. Therefore, it is recommended that the proposed development be supported/ authorized subject to the compilation of a SWMP which includes required engineering parameters (Appendix 4B) and the management of potentially sewage- and/or solid waste-contaminated stormwater runoff.

6.5 SOLID WASTE (REFUSE) REMOVAL

According to the Integrated Development Plan, 2019 – 2022, the proportion of households in Kheis whose refuse is removed by a local authority at least once a week increased from 48.1% in 1996 to 62.0% in 2016. However, there was an increase in the proportion of households that have no rubbish disposal from 1.6% in 1996 to 7.6% in 2016. The IDP also states that in 2016, 21.1% of households dispose of waste via their own refuse dump. This is evident in the large amounts of domestic waste observed dumped on the site. A designated solid waste site will be upgraded to accommodate the additional 370 erven.

6.6 ELECTRICITY

As per INEP Guidelines, the expected additional load of the proposed development will initially be 162KVA. The proposed site for development falls within the Eskom Distribution area and existing electrified households purchase electricity directly from Eskom and nit via !Kheis Local Municipality. Currently, the bulk connection to the Grootdrink settlement is via a 22kV overhead line from the Eskom 10MVA Grootdrink substation – which is in the process of being upgraded to a 20MVA (to be commissioned in December 2020). The existing overhead feeder will only be able to accommodate the future additional 660kVA load once the Grootdrink 10MVA substation has been commissioned.

It must be noted that the internal electrical network extension can only be carried out by Eskom after formulation processes have been completed as the area falls under Eskom's jurisdiction.

Funding can be applied for through the Municipal Infrastructure Grant (MIG) and Regional Bulk Infrastructure Grant (RBIG) whereas funding for the WWTW repair work can be applied for from the Water and Sanitation Infrastructure Grant (WSIG).

7. PROCESS TO DATE

The section below outlines the various tasks undertaken to date, the members of the team involved in the project, as well as the Public Participation Process.

6.1 TASKS UNDERTAKEN TO DATE

Table 3. Tasks undertaken in the EIA to date and way forward

Date	Action		Responsible Party	Completed
17th April 2020	Clarification meeting with client and appointment of environmental assessment practitioner (EAP) for EIA and environmental authorisation (EA) application		EnviroAfrica and Macroplan	
7th May 2020	Appointment of specialists for EIR assessments: **- Botanical Specialist (Mr Peet Botes)** **- Freshwater Specialist (Dr Dirk van Driel)** **- Archaeological Specialist (Mr Jan Engelbrecht)**		Mr Peet Botes Dr Dirk van Driel Mr Jan Engelbrecht	
10-14th May 2020	Draft Scoping Report compilation		EnviroAfrica	
19th May 2020	EAP site visit		EnviroAfrica	
19th May 2020	Public participation (PP): - Letter drops (Adjacent Landowner Notification); - Poster placement (Public notice board at the !Kheis - Local Municipality, public notice board of AgriMark (Groblershoop), Grootdrink 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 (published on 11th June 2020) PP comment period must be a minimum of 60 days[8]		EnviroAfrica	
18-22nd May 2020	Specialist site visits	Botanical Assessment	Mr Peet Botes	
18-22nd May 2020		Freshwater Assessment	Dr Dirk Van Driel	
18-31st May 2020		Archaeological Assessment	Mr Jan Engelbrecht	
14th August 2020	Advert comment period ends (*60-day comment period as per new directions*)			

[8]As 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.

Application and Scoping Phase			
29/07/2020	Submitted Application Form and Draft Scoping Report (incl. the Plan of Study for EIA) for 60 day comment period.	Enviroafrica	
Comment period ends on **07/10/2020**	EAP to notify the registered I&APs (incl. the State departments) of the availability of the draft SR. Commenting period of 30 days + 30days for I&APs and State departments to comment. Ends on **07 October 2020.**	Enviroafrica	
09/10/2020 – 23/11/2020	Submitted Final Scoping Review to DENC for Approval (43 days)	EnviroAfrica / DENC	
28/01/2021-01/03/2021	**Submit Draft EIR once approval of Final Scoping Report has been received from DENC**. Notify I&APs regarding availability of Draft EIR for comment. 30 Day Comment period ends on **1st March 2021.** ***Extension to process and invoicing dates due to (i) DEFF's response to COVID-19 (i.e. requirement to extend EIA timeframes and commenting periods)[1] and (ii) DENC on leave from 15th December 2020 – 05th January 2021 (this period of time has to be excluded from the EIA process) .**	EnviroAfrica	
TBC	Submit Final EIR (depending on types of comments received during the Draft EIR phase and degree to which the report must be amended) for Decision Making (107 day period). ***Extension to process and invoicing dates due to (i) DEFF's response to COVID-19 (i.e. requirement to extend EIA timeframes and commenting periods)[1] and (ii) DENC on leave from 15th December 2020 – 05th January 2021 (this period of time has to be excluded from the EIA process) .**	EnviroAfrica / DENC	

Completed **Still to be Completed**

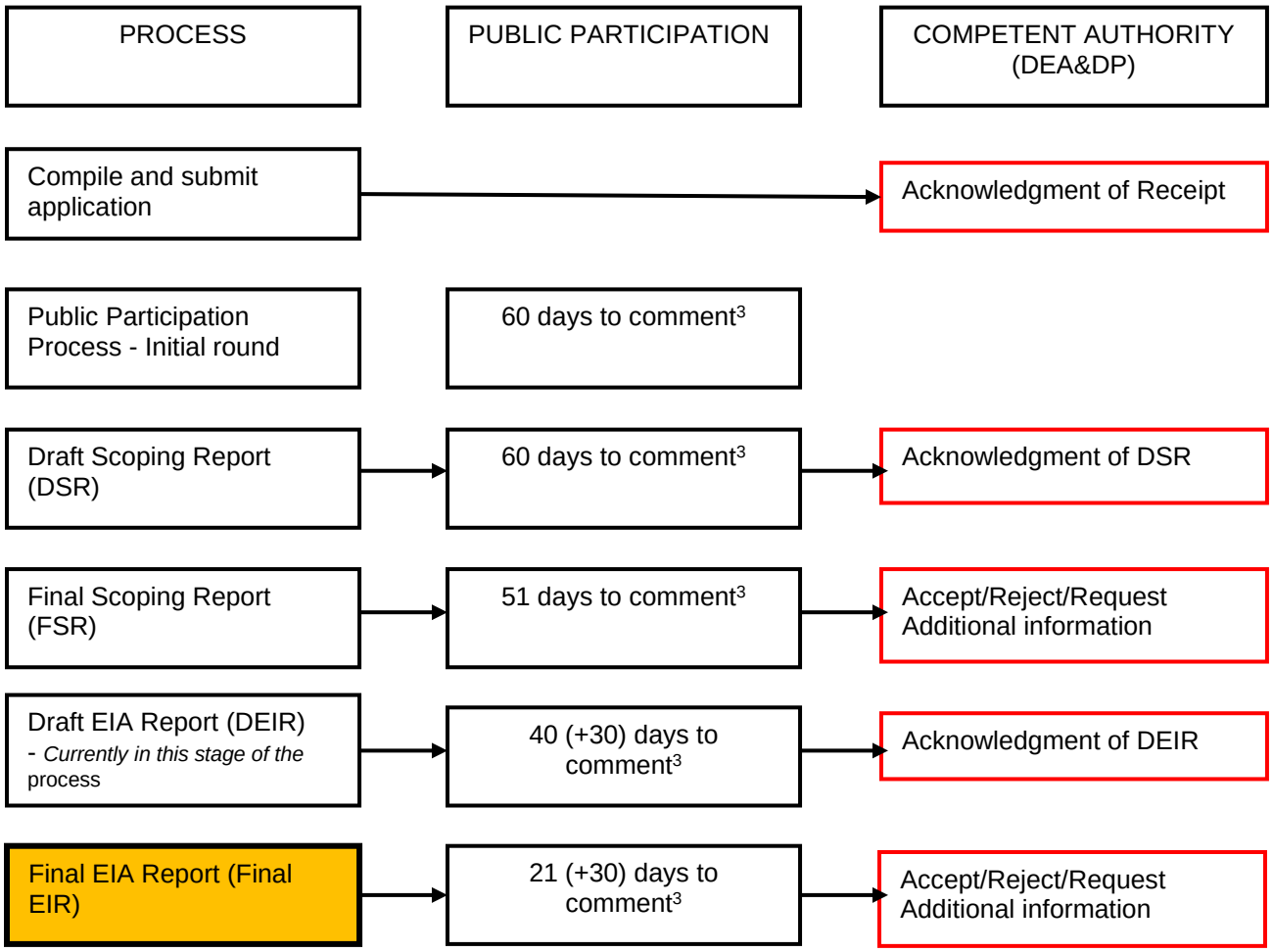


Figure 25. Summary of the EIA process and public participation process. The red indicates the stages where the competent authority was consulted during the process.

6.2 TASKS TO BE UNDERTAKEN DURING THE EIA PHASE

The following tasks must still be undertaken during the EIA phase of the process:

- Compile Draft Environmental Impact Report (EIR) for public comment based on specialist information.
- Advertise Draft EIR for public comment
- Distribute and/or make the Draft EIR available for viewing and comment
- Receive comments on Draft EIR. All comments received and responses to the comments will be incorporated into the Final Environmental Impact Report (EIR)
- Preparation of a FINAL EIR for submission to DE&NC for consideration and decision-making.

Please refer to Table 3 to see where the public participation process is present in the environmental impact assessment. The Interested and Affected Parties will have the opportunity to view and comment on all the reports that are submitted. The figures also indicate 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 DE&NC for consideration and decision-making.

Correspondence with I&APs will be via post, 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. DE&NC will be informed of any changes in the process.

6.3 PROFESSIONAL TEAM

The following professionals are part of the project team.

Table 4. Members of the professional team

DISCIPLINE	SPECIALIST	ORGANISATION
Environmental Consultants	Clinton Geyser / Bernard de Witt	**EnviroAfrica**
Town Planners	Len Fourie	**MacroPlan Town and Regional Planners**
Consulting Engineers	Malcolm du Plessis	**Bvi Engineers**
Botanist	Peet Botes	**PB Consult**
Heritage	Jan Englebrecht	**Ubique Heritage Consultants**
Freshwater	Dr Dirk van Driel	**Watsan Africa**
Geo-technical	F. J. Breytenbach	**Cedarland Geotechnical Consult (Pty) Ltd**

6.4 PUBLIC PARTICIPATION

A Public Participation Process was undertaken in accordance with the requirements of the NEMA Environmental Impact Assessment Regulations: Guideline and Information Document Series. *Guidelines on Public Participation 2013* and the NEMA EIA Regulations 2014 (amended). Issues and concerns raised during the Scoping phase are dealt within this report. Please note that the proposed public participation processes were in line with the new Directions, published by the Department of Environment, Forestry, and Fisheries (DEFF) on the 5th June 2020[9].

7.4.1 PUBLIC PARTICIPATION UNDERTAKEN DURING SCOPING PHASE:

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 3.**

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. (please refer to **Appendix 3D**). Posters were placed in conspicuous areas such as the entrance to the development and areas receiving the majority of foot traffic.

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): The background information document was given to residents adjacent to the proposed site for development via letter drops (**Appendix 3C**).

[9]As 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.

R41 (2) (b) (iii): An initial notification letter was sent to Mr Silo, the Councillor for Ward 4 (the ward in which the site is situated) (please refer to **Appendix 3C** for proof of notification letters sent). A notification letter, notifying I&APs of the release of the Draft Scoping Report, was sent to Mr Silo as well as Mr Beukes (PR Councillor).

R41 (2) (b) (iv): An initial notification letter was sent to the !Kheis Municipality as the municipality is the Applicant. A notification letter, notifying the I&AP of the release of the Draft Scoping Report, was sent to the Applicant.

R54 (2) (b) (v): Initial notification letter (please refer to **Appendix 3C** for proof of notification letters sent) will be sent to the following organs of state having jurisdiction in respect of any aspect of the activity:

- Northern Cape Department of Agriculture and Land Reform
- Department of Co-operative Governance, Human Settlements, and Traditional Affairs
- Department of Roads and Public Works
- Department of Agriculture, Forestry and Fisheries
- Department of Water and Sanitation
- SANRAL
- South African Heritage Resource Agency (SAHRA)
- Department of Social Development
- Department of Economic Development and Tourism
- Department of Transport, Safety and Liaison
- Eskom

A notification letter, notifying the I&AP of the release of the Draft Scoping Report, was sent to the following Registered I&APs:

- Northern Cape Department of Agriculture and Land Reform;
- Department if Cooperative Governance, Human Settlements and Traditional Affairs;
- Department of Roads and Public Works;
- Directorate Forestry Management;
- Department of Water and Sanitation;
- SANRAL;
- South African Heritage Resource Agency;
- Department of Social Development;
- Economic Development and Tourism - Northern Cape;
- Department: Transport, Safety and Liaison;
- Eskom

R41 (2) (c) (i): An advertisement was placed in the local newspaper, Kalahari Bulletin, on the 11th June 2020 (please refer to **Appendix 3B** for proof of advertisement).

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 were given more than a 60-day[3] registration and comment period during the first round of public participation.

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 refer to **Appendix 3A** for the list of Interested and Affected Parties.

Please find attached in **Appendix 3**:

- Proof of Notice boards, advertisements and notices that were sent out
- List of registered interested and affected parties
- Summary of issues raised by interested and affected parties

7.4.2 PUBLIC PARTICIPATION UNDERAKEN DURING THE EIA PHASE:

A number of groups and individuals were identified as Interested and Affected Parties during the initial and Scoping Public Participation Process. A complete list of organisations and individual groups identified to date, as well as those I&APs that have registered are shown in **Appendix 3A.**

Full copies of the Environmental Impact Assessment Report (EIR) was made available to all Registered I&APs, and were notified of the Environmental Impact Report (EIR) by means of notifications, informing them of the availability of the Draft EIR and were invited to comment. The EIR was made available for a 30-day comment period[3].

At the end of the comment period, the EIR was revised in response to feedback received from I&APs. All comments received and responses to the comments were incorporated into the Final Environmental Impact Report (Final EIR) in the **form of a Comments and Response Table**. The Final EIR wasl then be submitted to D:E&NC for decision.

Should it be required, this process may be adapted depending on input received during the ongoing process and as a result of public input. Both DENC and registered I&APs were informed of any changes in the process.

7.4.3 INTERESTED AND AFFECTED PARTIES

Interested and Affected Parties (I&APs) have been notified by means of advertisements in a local newspapers (Kalahari Bulletin), letters, site notices, smses (WinSMS), and/or emails sent to registered I&APs on the project database.

A list of I&APs is included as **Appendix 3A**.

8. ENVIRONMENTAL ISSUES AND POTENTIAL IMPACTS

Environmental issues were raised through informal discussions with the project team, specialists, and authorities, as well as by Interested and Affected Parties during the public participation period of the Scoping Report. All issues raised were addressed and assessed in the specialist reports and services report and forms part of this Environmental Impact Report. Any additional issues raised during the public participation will be listed and addressed in the Final Environmental Impact Report.

The following potential issues have been identified:

6.1 BIODIVERSITY

8.1.1 BOTANICAL

The Botanical Impact Assessment (**Appendix 6A**) describes and assesses 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 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.

8.1.2 FAUNA

Please note that no fauna or avi-fauna screening was done as part of this study and that the following notes are just observations with regards to status of the study area and observations made during the botanical site visit. The proposed site is located adjacent to the existing settlement where current land-uses include illegal dumping and livestock grazing. The vegetation associated can be classified as disturbed due to previous human-induced activities (i.e. trampling, overgrazing, illegal dumping of waste, and transformation of land leading to erosion).

Faunal diversity changes through space and time and are directly influenced by anthropogenic activities, including animal husbandry (i.e. overgrazing by livestock) and human settlements (e.g. transformation of land) (Tilman et al., 1997[10]; Chapin et al., 2000)[11]. Direct impacts are typically associated with urban land

[10] Tilman, D. and Wardle, D.A., 1997. Biodiversity And Ecosystem Properties. *Science*, *278* (5345), pp.1865-1869.

[11] Chapin Iii, F.S., Zavaleta, E.S., Eviner, V.T., Naylor, R.L., Vitousek, P.M., Reynolds, H.L., Hooper, D.U., Lavorel, S., Sala, O.E., Hobbie, S.E. and Mack, M.C., 2000. Consequences of changing biodiversity. *Nature*, *405*(6783), pp.234-242.

expansion, leading to land cover changes (and consequent loss of natural areas) and edge effects, whereas indirect impacts include impacts associated with the generation of waste (e.g. general or sewage) and its management (McDonald *et al.,* 2020)[12]. Edge effects have diverse impacts on biodiversity and ecological functioning (Razafindratsima *et al.,* 2018)[13]. Such effects contribute to a disturbance factor, which is likely to have driven most wild animals away from the proposed site for development due to activities associated with the adjacent settlement. It is considered highly unlikely that any large game remains in this area and were not observed within the development footprint during the site visit. This in turn would have affected the food chain and ultimately the density of tertiary predators, particularly mammals and larger birds of prey, while smaller predators and scavengers such as jackal and caracal may have been eradicated by community members in existing settlements in fear of their livestock. Due to long-term impacts associated with human settlements, compounded by the proximity of the proposed development areas to the urban edge, a comprehensive faunal survey is not deemed necessary.

Mammals

The Kgalagadi Transfrontier Park (approximately 250km) and Tswalu Kalahari Reserve (approximately 144km) are the closest protected areas to the proposed site for development. Mammalian species present in these reserves include, but are not limited to the African Striped Weasel, African Wild Cat, African Wild Dog (Painted Wolf) Antbear (Aardvark), Bat-Eared Fox, Black-Backed Jackal, Black-Tailed Tree Rat, Blue Wildebeest, Brant's Whistling Rat, Brown Hyena, Bushveld Elephant-Shrew, Cape Golden Mole, Cape Hare, Cape Serotine Bat, Caracal, Chacma Baboon, Cheetah, Common Mole Rat, Damara Mole Rat, Desert Musk Shrew, Egyptian Free-Tailed Bat, Egyptian Slit-Faced Bat, Eland, Gemsbok, Giraffe, Grass Climbing Mouse, Grey Duiker, Ground Squirrel, Hairy-Footed Gerbil, Highveld Gerbil, Honey Badger, Kudu, Large-Eared Mouse, Leopard, Lion, Namaqua Rock Mouse, Pangolin, Porcupine, Pouched Mouse, Pygmy Mouse, Red Hartebeest Round-Eared Elephant Shrew, Short-Tailed Gerbil, Silver (Cape) Fox, Slender Mongoose, Small Spotted Cat, Small-Spotted Genet, South African Hedgehog, Spotted Hyena, Springbok, Springhare Steenbok, Striped Mouse Striped Polecat, Suricate, Vervet Monkey, Warthog, Woosnam's Desert Rat, and Yellow Mongoose (https://www.sanparks.org/parks/kgalagadi/conservation/ff/mammals.php) / (https://tswalu.com/wp-content/uploads/2019/07/Tswalu-Information-Guide-2019.pdf). However, the only mammals observed on site include livestock (namely goats, sheep, and / or cows). Moreover, as per the Freshwater Report, no other endangered species, either plant or animal, were observed within or near the drainage line.

Avifauna

Although the Bushmanland Arid Grassland vegetation type potentially attracts a number of bird species, the low vegetation species diversity (associated with the proposed site for development), is likely to result in a low avifaunal diversity, where avifaunal diversity is directly influenced by land cover (i.e. intact vegetation) (Lepczyk *et al.,* 2017)[14]. Limited vegetation, present on site, is available to provide a range of avifauna adequate habitat for survival, and therefore, it was not envisaged that a comprehensive avifaunal survey was deemed necessary.

[12] McDonald, R.I., Mansur, A.V., Ascensão, F., Crossman, K., Elmqvist, T., Gonzalez, A., Güneralp, B., Haase, D., Hamann, M., Hillel, O. and Huang, K., 2020. Research gaps in knowledge of the impact of urban growth on biodiversity. *Nature Sustainability*, *3*(1), pp.16-24.

[13] Razafindratsima, O.H., Brown, K.A., Carvalho, F., Johnson, S.E., Wright, P.C. and Dunham, A.E., 2018. Edge effects on components of diversity and above-ground biomass in a tropical rainforest. *Journal of applied ecology*, *55*(2), pp.977-985.

[14] Lepczyk, C.A., La Sorte, F.A., Aronson, M.F., Goddard, M.A., MacGregor-Fors, I., Nilon, C.H. and Warren, P.S., 2017. Global patterns and drivers of urban bird diversity. In *Ecology and conservation of birds in urban environments* (pp. 13-33). Springer, Cham.

Reptile & amphibians

No reptile or amphibian species were observed during the site survey. The project footprint may provide habitat for a number of reptile species, but they would most likely be terrestrial species adapted to grasslands and preying on avifauna and small mammal species. No amphibian species are likely to occur due to a lack of adequate aquatic and wetland habitat within the proposed footprint.

6.2 HERITAGE

The possible impact on heritage resources (archaeological and palaeontological) has been identified as a possible environmental impact as a result of the construction of the residential development and associated infrastructure.

A Heritage Impact Assessment (**Appendix 6B**) has been conducted on the site.

The terms of reference for the heritage and archaeological study are as follows:

- 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.

Also, the HIA 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.

6.3 FRESHWATER ASSESSMENT

Freshwater (**Appendix 6C**) 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).

6.4 GEO-TECHNICAL ASSESSMENT

A Geo-technical assessment was required to provide information related to the soil types, soil potential, soil stability, subsoil structure, suitability of the area to support the proposed structures and recommendation for foundations.

The Geo-technical assessment is included as **Appendix 6D**.

6.5 VISUAL IMPACT

The potential impact on the sense of place of the proposed residential development has also been considered. However, due to the nature of the activity, the surrounding land-uses and the proximity to other existing residential area, and that the sense of place is not expected to be significantly altered by the proposed residential development, no further studies were suggested.

6.6 Traffic Impact Assessment

A letter was submitted to the SANRAL (Appendix 3E.2.1). The objectives of the letter were to:

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);

SANRAL's response to the aforementioned letter included, but was not limited to, approving the submitted site development plan, a permanent 2m fence must be erected on the boundary of the land development area and the national road reserve, no new access to the national road will be allowed. **A Traffic Impact Assessment (TIA) was not requested / required by SANRAL.** Please refer the SPLUMA Application (Appendix 4A) for more information.

6.7 OTHER ISSUES AND IMPACTS

The proposed Grootdrink Housing Development has the following additional impacts:

6.7.1 ENERGY REQUIREMENTS

Construction energy requirements:
The proposed development involves the construction of approximately 370 erven. Subsequently, the initial energy requirements of the project will basically be limited to the use of small power tools, plant such as mixers etc. typically to be powered by portable on-site generators.

Operational phase energy requirements:
According to the Engineering Services Investigation Report, although the existing feeder can service the future additional 660kVA load, this can only be carried out once the 10MVA Grootdrink substation has been upgraded to a 20MVA substation by Eskom (to be commissioned in December 2020).

6.1.1 WATER REQUIREMENTS

Construction water requirements:

Water requirements during the construction phase are unknown at this stage, but it is estimated that a maximum amount in the order of 100 - 150 kiloliter per day will be required for construction purposes, depending on phasing of construction.

Operational phase water requirements:

According to Draft Engineering Services Investigation Report, the Annual Average Daily Demand will be 458.7m^3/day.

6.1.1 NATURE AND QUANTITY OF RAW MATERIALS

This project comprises the construction of approximately 370 residential and other structures. Subsequently several thousand cubic meters of crushed stone, sand and / or cement will be utilized together with reinforcing steel, wood and other material used in the construction of residential units, schools, businesses, etc., as input materials during construction.

Exact quantities can only be determined once detailed designs of the structures have been completed.

This development is not expected to utilize any raw materials during the operational phase, besides water usage.

6.1.1 WASTE TYPES, QUANTITIES AND DISPOSAL METHODS

Construction Phase
As this is a “greenfields” project, there are no existing structures to be demolished. It is therefore envisaged that very little building rubble and waste will be generated during construction. Typically, losses of raw materials due to transport, stockpiling on site and conveyance losses amount to approximately 5% of the volumes required. It is not known how much solid waste will be generated during the construction period. This waste will however typically be builder’s rubble, concrete debris, timber from used shutters, etc. The waste will be stockpiled on site and periodically disposed of at the nearest licensed landfill site by the contractor. A designated spoil site will be investigated for stockpiling of material.

The large amounts of litter presently on site will also need to be consolidated, removed from site and disposed of at the nearest approved municipal waste disposal site.

Operational Phase

Since the development is generally a residential development, general residential household waste is expected to be generated. Refuse removal should be via the Municipal waste stream and disposed of at the nearest, registered municipal bulk solid waste disposal site.

6.1.2 EMPLOYMENT OPPORTUNITIES

Please refer to Section 5.7 and Table 1 for the anticipated employment opportunities expected from the proposed development.

9. SPECIALIST STUDIES

Based on the environmental sensitivities as per the DEA Screening Tool, issues raised by the I&APs and the project team, specialist studies were undertaken to provide information to address the concerns and assess the impacts of the proposed development alternatives on the environment.

The specialists were provided with set criteria for undertaking their assessments, to allow for comparative assessment of all issues. These criteria are detailed in the Terms of Reference to each specialist and summarised below.

7.1 CRITERIA FOR SPECIALIST ASSESSMENT OF IMPACTS

These criteria are based on the EIA Regulations, published by the Department of Environmental Affairs and Tourism (April 1998) in terms of the Environmental Conservation Act No. 73 of 1989.

These criteria include:

- **Nature of the impact**
  This is an appraisal of the type of effect the construction, operation and maintenance of a development would have on the affected environment. This description should include what is to be affected and how.
- **Extent of the impact**
  Describe whether the impact will be: local extending only as far as the development site area; or limited to the site and its immediate surroundings; or will have an impact on the region, or will have an impact on a national scale or across international borders.
- **Duration of the impact**
  The specialist should indicate whether the lifespan of the impact would be short term (0-5 years), medium term (5-15 years), long terms (16-30 years) or permanent.
- **Intensity**
  The specialist should establish whether the impact is destructive or benign and should be qualified as low, medium or high. The specialist study must attempt to quantify the magnitude of the impacts and outline the rationale used.
- **Probability of occurrence**
  The specialist should describe the probability of the impact actually occurring and should be described as improbable (low likelihood), probable (distinct possibility), highly probable (most likely) or definite (impact will occur regardless of any prevention measures).

The impacts should also be assessed in terms of the following aspects:

- **Status of the impact**
  The specialist should determine whether the impacts are negative, positive or neutral (“cost – benefit” analysis). The impacts are to be assessed in terms of their effect on the project and the environment. For example, an impact that is positive for the proposed development may be negative for the environment. It is important that this distinction is made in the analysis.
- **Accumulative impact**
  Consideration must be given to the extent of any accumulative impact that may occur due to the proposed development. Such impacts must be evaluated with an assessment of similar

developments already in the environment. Such impacts will be either positive or negative, and will be graded as being of negligible, low, medium or high impact.

- **Degree of confidence in predictions**
  The specialist should state what degree of confidence (low, medium or high) is there in the predictions based on the available information and level of knowledge and expertise.

Based on a synthesis of the information contained in the above-described procedure, the specialist is required to assess the potential impacts in terms of the following significance criteria:

- **No significance**: the impacts do not influence the proposed development and/or environment in any way.
- **Low significance**: the impacts will have a minor influence on the proposed development and/or environment. These impacts require some attention to modification of the project design where possible, or alternative mitigation.
- **Moderate significance**: the impacts will have a moderate influence on the proposed development and/or environment. The impact can be ameliorated by a modification in the project design or implementation of effective mitigation measures.
- **High significance**: the impacts will have a major influence on the proposed development and/or environment.

The final impact assessment report should at least include the following sections:

- Executive Summary
- Introduction and Description of Study
- Methodology
- Results
- Assessment of Impacts (including mitigation measures to reduce negative impacts and measures to enhance positive impacts and the completion of impact tables)
- Discussion
- Recommendations (Pre-Construction, Construction and Operational Phases)
- Conclusion

9.2 BRIEFS FOR SPECIALIST STUDIES TO BE UNDERTAKEN AS PART OF THE EIA

9.2.1 BOTANICAL ASSESSMENT

Peet Botes (PB Consult) was appointed and undertook the Botanical Assessment on the proposed site – **Appendix 6A**.

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.

9.2.2 HERITAGE IMPACT ASSESSMENT

Jan Engelbrecht of the Ubique Heritage Consultants was appointed to compile the Heritage Impact Assessment (HIA) – **Appendix 6B**.

The terms of reference for the heritage impact study were:

- 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.

Also, 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.

9.2.3 FRESHWATER ASSESSMENT

Dr Dirk van Driel (Watsan Africa) has been appointed to undertake the Freshwater Assessment for the proposed development – **Appendix 6C**.

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).

9.2.4 GEO-TECHNICAL ASSESSMENT

Cedarland Geotechnical Consult (Pty) Ltd was appointed to conduct the Geo-technical Assessment of the proposed site - **Appendix 6D**.

The primary objective of this study is to provide information related to the soil types, soil potential, soil stability, subsoil structure, suitability of the area to support the proposed structures and recommendation for foundations.

10. ASSESSMENT OF ENVIRONMENTAL IMPACTS

The specialist studies detailed in Section 8 were undertaken to determine significance of the impacts that may arise from the proposed development. The findings of the specialist studies are summarised here. Full copies of the studies are included in **Appendices 6A – 6C**.

The following specialist studies were undertaken:

10.1 BOTANICAL ASSESSMENT

Peet Botes (PB Consult) was appointed and undertook the Botanical Assessment on the proposed site – The Botanical Impact Assessment is included as **Appendix 6A**.

10.1.1 KEY FINDINGS

A Botanical Impact Assessment (**Appendix 6A**) was conducted to determine if there is any sensitive or endangered vegetation on the proposed site. Due to the size of the development (approximately 36ha), there will be a significant loss of vegetation during the construction phase of the project, of which approximately 50% is still covered by indigenous vegetation in a good condition. The site is located within a CBA area however, the specialist stated that large portions of the proposed site is already disturbed, and that there is no real alternative site within the Municipal town boundaries that is not located within the CBA. no recognized centre of endemism will be impacted by the proposed development. The transformation of the site will reduce connectivity on the site but should not result in a significant impact on the surrounding area, where connectivity is still good. The existing disturbance footprint has been described (please see Figure 6).

The vegetation component comprises of extensive-to-irregular plains on a slightly sloping plateau sparsely vegetated by grassland dominated by white grasses (*Stipagrostis* spp) giving this vegetation type the character of semidesert 'steppe'. In certain places, low shrubs of *Salsola* change the vegetation structure. In years of abundant rainfall rich displays of annual herbs can be expected. From a conservation perspective, the vegetation type is categorized as Least Threatened (LT) with a conservation target of 21%. Only small patches statutorily conserved in Augrabies Falls National Park and Goegab Nature Reserve. Very little of the area has been transformed. Erosion is very low (60%) and low (33%)[2].

As per the Botanical Assessment (Appendix 6A), the proposed development footprint is about 95 ha in size. The site includes various areas already degraded or disturbed, this include a number of illegal dumping sites, an area which seems to contain old sewerage ponds and an area where sewerage is running through the veld from a potentially broken pipeline (Figure 6).

The remaining natural veld was covered by a low sparse to very sparse shrubland, typically found in the Bushmanland Arid Grassland vegetation type on shallow soils on weathering rock dominated by quartz and calcrete. Although the Northern Cape are in the midst of a severe drought (the last 5 – 7 yeas), recent rains had brought some relieve, which can be seen in the display of grasses and the new growth shown by many a plant (although it had not as yet trigger a display of annual or herbaceous species). Although grasses were common, they were not as conspicuous as expected (especially after some rains). This is most probably an attribute of intensive grazing by livestock of the local people. The effect of grazing is also visible

through most of the veld, with most plants reduced to small or dwarf shrubs as a result of grazing and species restricted to the hardy unpalatable plant kind.

As per the Botanical Assessment, vegetation encountered during the site visit varied from lowly sparse-to-very sparse shrubland, dominated by *Tetraena decumbens,* whereas *Justicia australis* (=*Monechma*) and *Aptosimum spinescens* are also common. The following plants were also observe, scattered throughout the footprint: *Adenium cf. oleifolium, Aizoon burchellii* (common)*, Aloe claviflora* (very common), *Asparagus* species, *Atriplex lindleyi, Blepharis mitrata, Boscia albitrunca* (occasionally*), B. foetida* (occasionally), *Cynanchum viminale, Eriocephalus* species, *Euphorbia gariepina*, *Euphorbia braunsii* (occasionally), *Geigeria ornativa, Kleinia longiflora, Leucosphaera bainesii* (occasionally), *Rogeria longiflora, Salsola zeyheri, Tetraena microcarpa* (occasionally), *Tetraena rigida* and *Tribulus cf. zeyheri*. The invasive alien *Prosopis* tree was also occasionally observed.

The larger ephemeral drainage lines on the other hand were clearly marked by a denser and larger stand of vegetation, dominated almost exclusively by *Senegalia mellifera* (with the parasitic *Tapinanthus oleifolius* often observed on the tree). Other species encountered in these drainage lines includes larger shrubs like *Cynanchum viminale, Lycium cinereum*, *Phaeoptilum spinosum*, *Rhigozum trichotomum* and smaller trees like *Parkinsonia africana* as well as *Ziziphus mucronata* (medium sized tree). *Boscia albitrunca* (the most significant botanical feature) were also often observed near or within these drainage lines.

Table 5. Vegetation (including protected, non-protected, and alien invasive plant species) encountered on site.

No.	Species name	FAMILY	Status	Alien & invader plant (AIP)
1.	*Adenium* cf. *oleifolium*	APOCYNACEAE	LC NCNCA, Schedule 2 Protected (all species in this Family)	**Apply for a NCNCA Flora permit (DENC)**
2.	*Aizoon burchellii*	AIZOACEAE	Not evaluated NCNCA, Schedule 2 Protected (all species in this Family)	**Apply for a NCNCA Flora permit (DENC)**
3.	*Aloe claviflora*	ASPODELACEAE	LC NCNCA, Schedule 2 Protected (all species in this Family)	**Apply for a NCNCA Flora permit (DENC)**
4.	*Aptosimum spinescens*	SCROPHULARIACEAE	LC	
5.	*Asparagus* species	ASPARAGACEAE	LC	
6.	*Atriplex lindleyi*	AMARANTHACEAE	**Not indigenous**	Naturalised invader
7.	*Blepharis mitrata*	ACANTHACEAE	LC	
8.	*Boscia albitrunca*	BRASSICACEAE (CAPPARACEAE)	LC	**Apply for a NFA Tree**

No.	Species name	FAMILY	Status	Alien & invader plant (AIP)
			NFA protected species NCNCA, Schedule 2 Protected (all species of Boscia)	**permit (DAFF)** **Apply for a NCNCA Flora permit (DENC)**
9.	*Boscia foetida*	BRASSICACEAE (CAPPARACEAE)	LC NCNCA, Schedule 2 Protected (all species of Boscia)	**Apply for a NCNCA Flora permit (DENC)**
10.	*Cynanchum viminale (=Sarcostemma viminale)*	APOCYNACEAE	LC NCNCA, Schedule 2 Protected (all species in this Family)	**Apply for a NCNCA Flora permit (DENC)**
11.	*Euphorbia braunsii*	EUPHORBIACEAE	LC NCNCA, Schedule 2 Protected (all species in this Genus)	**Apply for a NCNCA Flora permit (DENC)**
12.	*Euphorbia gariepina*	EUPHORBIACEAE	NCNCA, Schedule 2 Protected (all species in this Genus)	**Apply for a NCNCA Flora permit (DENC)**
13.	*Geigeria ornativa*	ASTERACEAE	LC	
14.	*Justicia australis (=Monechma genistifolium)*	ACANTHACEAE	LC	
15.	*Kleinia longiflora*	ASTERACEAE	LC	
16.	*Leucosphaera bainesii*	AMARANTHACEAE	LC	
17.	*Lycium cinereum*	SOLANACEAE	LC	
18.	*Monsonia* cf. *salmoniflora*	GERANIACEAE	LC	
19.	*Parkinsonia africana*	FABACEAE	LC	
20.	*Phaeoptilum spinosum*	NYCTAGINACEAE	LC	
21.	*Prosopis* species	FABACEAE	**Alien invasive plant species**	
22.	*Rhigozum trichotomum*	BIGONACEAE	LC	
23.	*Rogeria longiflora*	PEDALIACEAE	LC	
24.	*Salsola zeyheri*	AMARANTHACEAE	LC	
25.	*Senegalia mellifera (=Acacia mellifera)*	FABACEAE	LC	
26.	*Tapinanthus oleifolius*	LORANTHACEAE	LC	
27.	*Tetraena decumbens (=Zygophyllum decumbens)*	ZYGOPHYLLACEAE	LC	

No.	Species name	FAMILY	Status	Alien & invader plant (AIP)
28.	*Tetraena microcarpa (=Zygophyllum microcarpum)*	ZYGOPHYLLACEAE	LC	
29.	*Tetraena rigida (=Zygophyllum rigidum)*	ZYGOPHYLLACEAE	LC	
30.	*Ziziphus mucronata*	RHAMNACEAE	LC	

With regards to protected plant species;
- No red-listed plant species were present within the development footprint;
- No NEM: BA protected species was observed;
- One plant species, namely *Boscia albitrunca* protected in terms of the NFA was observed

A NCNCA and / or NFA permits will be required for the removal of these protected plants.

Table 6: Location of NFA protected trees observed within or near the footprint (Source: Appendix 6A)

NO.	SPECIES NAME	COMMENTS	RECOMMENDATIONS
049 B alb	*Boscia albitrunca* S28° 33' 28.6" E21° 44' 59.6"	Medium sized shrub in poor condition (1.5 m tall)	Surrounding area already developed. Unlikely to be further disturbed as a result of the proposed activity.
050 B alb	*Boscia albitrunca* S28° 33' 28.3" E21° 44' 57.4"	Medium size shrub, poor condition (1.5 m tall)	Surrounding area already developed. Unlikely to be further disturbed as a result of the proposed activity.
054 B alb	*Boscia albitrunca* S28° 33' 48.0" E21° 44' 29.0"	Large sized shrub in relative good condition (1.8 m tall).	**Do not disturb if possible.**
055 B alb	*Boscia albitrunca* S28° 33' 48.6" E21° 44' 29.4"	Medium shrub in relative good condition (1.3 m tall).	**Do not disturb if possible.**
058 B alb	*Boscia albitrunca* S28° 33' 55.0" E21° 44' 34.8"	Small tree in good condition (2.54 m tall).	**Do not disturb (located next to stream)**

- Eight (8) plant species protected in terms of the NCNCA were identified within the development footprint (Table 4).

Table 7: Protected plant species in terms of the NCNCA. A permit is required should any individual of these protected plant species be disturbed, removed, or relocated.

NO.	SPECIES NAME	COMMENTS	RECOMMENDATIONS
1.	*Adenium cf. oleifolium* **Schedule 2 protected**		**Search & rescue:** Only one individual observed. Individuals within footprint to be transplanted to surrounding area.
2.	*Aizoon burchellii* **Schedule 2 protected**		Species protection through topsoil conservation.
3.	*Aloe claviflora* **Schedule 2 protected**		Very common plant in this area.
4.	*Boscia albitrunca* **Schedule 2 protected**		Refer to **Error! Reference source not found.**.
5.	*Boscia foetida* **Schedule 2 protected**		**Protect if possible** Only 5 individual observed.
6.	*Cynanchum viminale* **Schedule 2 protected**	Occasionally observed within the footprint.	Larger *Cynanchum* plants are expected to transplant poorly. Species protection through topsoil conservation.
7.	*Euphorbia braunsii* **Schedule 2 protected**		**Search & rescue:** Occasionally observed. Individuals within footprint to be transplanted to surrounding area.

NO.	SPECIES NAME	COMMENTS	RECOMMENDATIONS
8.	*Euphorbia gariepina* **Schedule 2 protected**		Occasionally observed. Larger *Euphorbia* tends to transplant very poorly. Species protection through topsoil conservation.

FAUNA

Please note that no fauna or avi-fauna screening was done as part of this study and that the following notes are just observations with regards to status of the study area and observations made during the botanical site visit. The proposed site is located adjacent to the existing settlement where current land-uses include illegal dumping and livestock grazing. The vegetation associated can be classified as disturbed due to previous human-induced activities (i.e. trampling, overgrazing, illegal dumping of waste, and transformation of land leading to erosion).

Faunal diversity changes through space and time and are directly influenced by anthropogenic activities, including animal husbandry (i.e. overgrazing by livestock) and human settlements (e.g. transformation of land) (Tilman et al., 1997[15]; Chapin et al., 2000)[16]. Direct impacts are typically associated with urban land expansion, leading to land cover changes (and consequent loss of natural areas) and edge effects, whereas indirect impacts include impacts associated with the generation of waste (e.g. general or sewage) and its management (McDonald *et al.,* 2020)[17]. Edge effects have diverse impacts on biodiversity and ecological functioning (Razafindratsima *et al.,* 2018)[18]. Such effects contribute to a disturbance factor, which is likely to have driven most wild animals away from the proposed site for development due to activities associated with the adjacent settlement. It is considered highly unlikely that any large game remains in this area and were not observed within the development footprint during the site visit. This in turn would have affected the food chain and ultimately the density of tertiary predators, particularly mammals and larger birds of prey, while smaller predators and scavengers such as jackal and caracal may have been eradicated by community members in existing settlements in fear of their livestock. Due to long-term impacts associated with human settlements, compounded by the proximity of the proposed development areas to the urban edge, a comprehensive faunal survey is not deemed necessary.

Mammals

The Kgalagadi Transfrontier Park (approximately 250km) and Tswalu Kalahari Reserve (approximately 144km) are the closest protected areas to the proposed site for development. Mammalian species present in these reserves include, but are not limited to the African Striped Weasel, African Wild Cat, African Wild

[15] Tilman, D. and Wardle, D.A., 1997. Biodiversity And Ecosystem Properties. *Science*, *278* (5345), pp.1865-1869.

[16] Chapin Iii, F.S., Zavaleta, E.S., Eviner, V.T., Naylor, R.L., Vitousek, P.M., Reynolds, H.L., Hooper, D.U., Lavorel, S., Sala, O.E., Hobbie, S.E. and Mack, M.C., 2000. Consequences of changing biodiversity. *Nature*, *405*(6783), pp.234-242.

[17] McDonald, R.I., Mansur, A.V., Ascensão, F., Crossman, K., Elmqvist, T., Gonzalez, A., Güneralp, B., Haase, D., Hamann, M., Hillel, O. and Huang, K., 2020. Research gaps in knowledge of the impact of urban growth on biodiversity. *Nature Sustainability*, *3*(1), pp.16-24.

[18] Razafindratsima, O.H., Brown, K.A., Carvalho, F., Johnson, S.E., Wright, P.C. and Dunham, A.E., 2018. Edge effects on components of diversity and above-ground biomass in a tropical rainforest. *Journal of applied ecology*, *55*(2), pp.977-985.

Dog (Painted Wolf) Antbear (Aardvark), Bat-Eared Fox, Black-Backed Jackal, Black-Tailed Tree Rat, Blue Wildebeest, Brant's Whistling Rat, Brown Hyena, Bushveld Elephant-Shrew, Cape Golden Mole, Cape Hare, Cape Serotine Bat, Caracal, Chacma Baboon, Cheetah, Common Mole Rat, Damara Mole Rat, Desert Musk Shrew, Egyptian Free-Tailed Bat, Egyptian Slit-Faced Bat, Eland, Gemsbok, Giraffe, Grass Climbing Mouse, Grey Duiker, Ground Squirrel, Hairy-Footed Gerbil, Highveld Gerbil, Honey Badger, Kudu, Large-Eared Mouse, Leopard, Lion, Namaqua Rock Mouse, Pangolin, Porcupine, Pouched Mouse, Pygmy Mouse, Red Hartebeest Round-Eared Elephant Shrew, Short-Tailed Gerbil, Silver (Cape) Fox, Slender Mongoose, Small Spotted Cat, Small-Spotted Genet, South African Hedgehog, Spotted Hyena, Springbok, Springhare Steenbok, Striped Mouse Striped Polecat, Suricate, Vervet Monkey, Warthog, Woosnam's Desert Rat, and Yellow Mongoose (https://www.sanparks.org/parks/kgalagadi/conservation/ff/mammals.php) / (https://tswalu.com/wp-content/uploads/2019/07/Tswalu-Information-Guide-2019.pdf). However, the only mammals observed on site include livestock (namely goats, sheep, and / or cows). Moreover, as per the Freshwater Report, no other endangered species, either plant or animal, were observed within or near the drainage line.

Avifauna

Although the Bushmanland Arid Grassland vegetation type potentially attracts a number of bird species, the low vegetation species diversity (associated with the proposed site for development), is likely to result in a low avifaunal diversity, where avifaunal diversity is directly influenced by land cover (i.e. intact vegetation) (Lepczyk *et al.,* 2017)[19]. Limited vegetation, present on site, is available to provide a range of avifauna adequate habitat for survival, and therefore, it was not envisaged that a comprehensive avifaunal survey was deemed necessary.

Reptile & amphibians

No reptile or amphibian species were observed during the site survey. The project footprint may provide habitat for a number of reptile species, but they would most likely be terrestrial species adapted to grasslands and preying on avifauna and small mammal species. No amphibian species are likely to occur due to a lack of adequate aquatic and wetland habitat within the proposed footprint.

10.1.2 IMPACT ASSESSMENT

Direct impacts

According to the Botanical Impact Assessment (**Appendix 6A**), the main impacts associated with the proposed development will be:

- The transformation of 36 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.

10.1.3 MITIGATION MEASURES

The following mitigation measures are recommended by the Botanical Impact Assessment:

- 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.

[19] Lepczyk, C.A., La Sorte, F.A., Aronson, M.F., Goddard, M.A., MacGregor-Fors, I., Nilon, C.H. and Warren, P.S., 2017. Global patterns and drivers of urban bird diversity. In *Ecology and conservation of birds in urban environments* (pp. 13-33). Springer, Cham.

- 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
- **Before any work is done** search & rescue
- 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).

10.1.4 CONCLUSION

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 36 ha of land, of which approximately 50 – 55%is still covered by indigenous vegetation in good condition. The site overlaps an identified critical biodiversity area (according to the 2016, Northern Cape Critical Biodiversity Areas maps). Five (5) protected Sheppard trees (*Boscia albitrunca*), and eight (8) Northern Cape Nature Conservation Act, protected species were observed within the footprint.

According to the impact assessment, the proposed Grootdrink development is likely to result in a Medium-Low impact, which can be reduced to a Low impact with good environmental control during construction. Therefore, 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.

10.2 HERITAGE IMPACT ASSESSMENT

Jan Engelbrecht of the Ubique Heritage Consultants was appointed to undertake a Heritage Impact Assessment (HIA) of the proposed site. The HIA is included as **Appendix 6B**.

10.2.1 KEY FINDINGS

According to the Heritage Impact Assessment (**Appendix 6B**);

1. Surface scatters of MSA/ELSA lithic material, and incidences of 20th-century munitions were recorded outside the development footprint.
2. The formal Grootdrink cemetery located outside the development footprint.
3. The Palaeontological Sensitivity of the Kalahari Group is low, the Boom River Formation is

insignificant, and the Precambrian rocks of the Transvaal Supergroup is moderate.

10.2.2 IMPACT ASSESSMENT

According to the Heritage Impact Assessment (**Appendix 6B**),

1. The Early/Middle/Late Stone Age cultural material identified is not conservation worth;
2. This site is graded as IIIB and is of High Local Significance.
3. This site is graded as IIIB and is of High Local Significance.
4. The site has a low palaeontological significance

Therefore, the impact on Archaeological and Historical resources is considered to be Low as no significant heritage sites or features were identified within the surveyed sections of the proposed Grootdrink township expansion,

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. 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.

10.2.3 MITIGATION MEASURES

According to the Heritage Impact Assessment (**Appendix 6B**), 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:

- No significant heritage sites or features were identified within the proposed Grootdrink development footprint. No further mitigation is required for the proposed development on these properties. Therefore, from a heritage point of view, we recommend that the proposed development can continue.
- The Early/Middle Stone Age and 20th-century cultural material identified proposed Grootdrink development footprint, is situated outside the development footprint and is not conservation worthy. No further mitigation is recommended with regards to these resources.
- The Grootdrink cemetery is situated outside the development footprint. The site is graded as IIIB and is of High Local Significance. It is recommended that the graves be fenced off with the inclusion of a 50 m buffer/safety zone.
- 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).

- 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.

10.2.4 CONCLUSION

As per the Heritage Impact Assessment (**Appendix 6B**), this undertaken HIA identified no heritage resources that will be impacted negatively by the proposed development and thus, in this regard the specialist concluded that the proposed development may continue.

10.3 FRESHWATER ASSESSMENT

Dr Dirk van Driel (Watsan Africa) was appointed to undertake the Freshwater Assessment for the proposed development. The Freshwater Impact Assessment is included as **Appendix 6C**.

10.3.1 KEY FINDINGS

According to the Freshwater Assessment (**Appendix 6C**), the drainage lines are mostly dry, with water only during rains and perhaps shortly thereafter. During the infrequent heavy rainfall events, 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. Two small sub-catchments can be distinguished around the township of Grootdrink. The one to the north is 283 ha, with a circumference of 7.4km. The one to the south is 174 ha with a circumference of 6.5ha. Most of the existing Grootdrink is on a flat piece of land in between these two sub-catchments. This land is without a discernible drainage line. To the north of Grootdrink, a well-defined and much larger drainage lines can be observed. This does not have any bearing on Grootdrink. The two confluences with the Orange River are fairly natural, if compared to some of the other heavily canalised ones. The drainage lines are small, but despite of their size, they have large culverts underneath the N10 whereas the smaller drainage line in between, just four concrete pipes underneath the road. The drainage line in sub-catchment 1 will be just touching on the boundary of the new development. If a buffer zone of 32m is to be maintained, it would contribute much towards meeting the legal requirements. If this would take away too much from the available land for development, a decrease of the

buffer zone of 15m or 20m can be motivated for. The drainage line in sub-catchment 2 would pass right through the new development. A strip of land of 50m wide should be left open around the drainage line. Since these drainage lines are small, formalised drainage canals, straightened and clad with concrete, won't be necessary, as the flood risks are seemingly negligible. Large quantities of household solid waste were noticed along Grootdrink's main street as well as in the drainage lines

The waste problem would predictably escalate when new dwellings are added to the existing ones. Should these large quantities of waste wash down the drainage lines and into the Orange Rivers during rainfall events, it would pose a threat to the aquatic environment and to the local economy. Municipal services should resume prior to the expansion of the Grootdrink township.

The existing impacts on the drainage lines from the Grootdrink township, such as household waste, sewage, trampling and grazing, would increase, perhaps doubled, should the development go ahead. The cumulative impact of all developments along the Orange River in the !Kheis municipality can be substantial. The driver of the drainage lines 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 sewage and solid waste situation are threats to the WULA. The authorities may insist that these issues 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 Grootdrink.

Waste
During the Freshwater Specialist's site visit, numerous incidences of illegal dumping of solid waste were observed throughout the site including within the drainage lines. Such waste may wash into the drainage lines and subsequently down towards the Orange River.

Sewerage infrastructure was not functioning and could be negatively impact the receiving environment should any sewage be released into/ enters any of the drainage lines. Residents were observed throwing out greywater into the drainage lines. This would be expected to increase with an increase in households. The WWTWs will only be 300m away from the boundary of the new development, which is closer to the 500m that is normally prescribed.

10.3.2 IMPACT ASSESSMENT

As per the Freshwater Assessment (Figure 6C), the only drainage line of concern is the short one in the northern corner of the proposed development. The one that exists because of the dumping of sewage is not going to be evaluated. Likewise, the one along the N10 to the south of the proposed development is too far away. The two sub-catchments are similar, with the issues being the same. Therefore, towards the confluences. the sub-catchments have been lumped together for the purpose of the PES evaluation. The upper catchments are near-pristine, with only goats grazing. The middle section is impacted by urban development, along with the household waste and sewage issues. From the N10 to the vineyards, the drainage lines are more natural, while there is some impact from the surrounding vineyards. The drainage lines score a "C", somewhat impacted, but with most ecological functioning still intact. The riparian zones, score a "B", only slightly impacted, with basic ecological functioning still intact. It would require careful management and enforcement to keep the drainage lines they way they are and to prevent further downgrading when the new housing arrives. The Ecological Importance (EI) is based on the presence of especially fish species that are endangered on a local, regional or national level. There are no fish in the

drainage lines, 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. The existing impacts on the drainage lines from the Grootdrink township, including the illegal dumping of solid waste, sewage, trampling and grazing, would increase should the proposed development go ahead. The cumulative impact of sewage and solid waste ending up in the drainage line and Orange River

10.3.3 MITIGATION MEASURES

According to the Freshwater Report (**Appendix 6C**), the only real mitigation measures that would be effective is to re-instate municipal services such as waste collection, waste disposal and proper sewage treatment. Construction must be undertaken in the dry season, limiting the footprint and vegetating the disturbed areas. A formal cemetery should also be provided. The impact of animal husbandry (associated with overgrazing) and trampling by humans of drainage lines must be reduced.

10.3.4 CONCLUSION

As per the Freshwater Assessment (**Appendix 6C**), 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. The WULA and the EIA must provide mitigation measured for these impacts. The driver of the drainage lines 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 sewage and solid waste situation may negatively impact the freshwater features of the site. The authorities may insist that these issues be resolved before a General Authorization is approved.

10.4 GEO-TECHNICAL ASSESSMENT

Cedarland Geotechnical Consult (Pty) Ltd was appointed to undertake the Geo-technical Assessment as part of the EIA process, and is included as **Appendix 6D**.

10.4.1 KEY FINDINGS

According to the Geo-technical Assessment, the proposed site for development was regarded as being of intermediate suitability for the proposed residential development where founding conditions were designated as R and S. The following are the main conclusions that have been made:

- **Geology:**

  Bedrock present includes lower basalts of the Leerkrans Formation, Wilgenhoutsdrift Group and can be described as consisting of greenstone and green-schist. Volcanic features are present as metabasalt and felsic lava. Discontinuities in the basalt are open and filled with sand.

- **Soil Profile**:

The soil profile of the site is comprised of colluvium (consisting of pegmatitic gravels, weather resistant scree of quartz and quartzite fragments contained in a sandy matrix where nodules of calcrete may be contained), residual basalt (underlies the colluvium tending to be highly weathered, medium hard rock where calcification of the residual soil may occur), residual green-schist (underlying nodular calcrete supported by gravels of green-schist), fill (substantial areas of stockpiled rubble are present throughout the site where rubble consists of household waste, excavated calcrete and builder's rubble), Mokalanen Formation [hardpan calcrete (underlying colluvium which is very fine grained and very dense) , nodular calcrete (consisting of boulder calcrete underlying the colluvium directly as pure pedocrete to a sub-horizon of residual soil or as an extensively calcified and nodular horizon).

- **Hydrology:**

No perched groundwater was encountered on site during the geotechnical investigation (and is not anticipated to be problematic on site). Groundwater is expected to occur at depths less than 15m within compact, argillaceous strata. Successful drilling for water within the proposed site for development is expected to be between 40 – 60% whereas the drilling for a borehole yielding at least 2l/s ranges between 10 – 20%.

- **Conditions of excavation**

Entire site refusal of excavation on bedrock or very dense hardpan calcrete was encountered at depths ranging from 780mm deep (ranging from 100 – 1400mm). Thus, 22% of trenches to be excavated to depths of 1000mm may require drilling and blasting (and is classified as a hard excavation). If the required depth is to increase to 1500mm, 48% of the excavation may be classified as hard.

- **Geotechnical Classification:**

Overall, the entire site is regarded as suitable for residential development. The site is divided into three separate geotechnical zones (Figure 26).

Geotechnical Zone I

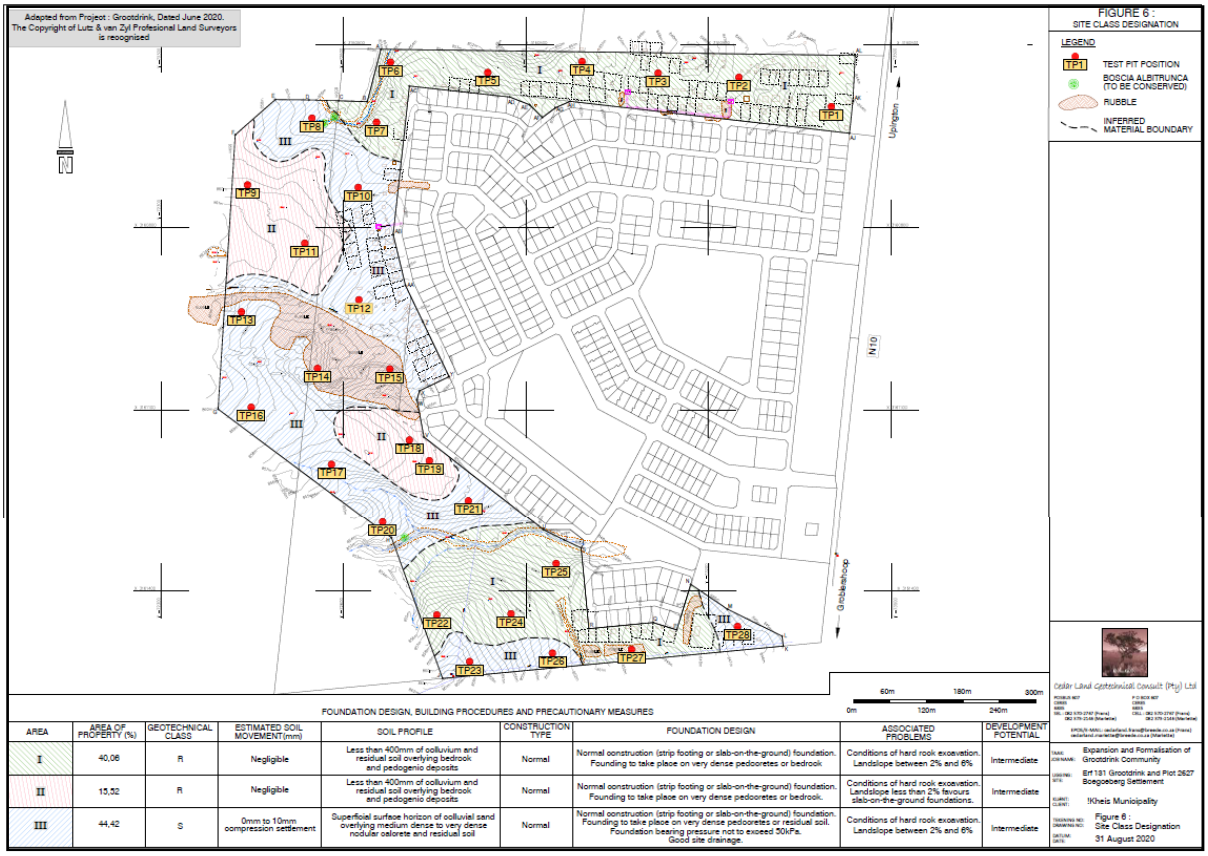
Zone classed as R (founding is stable and expected soil movement is negligible). Slope across the site is approximately between 2 – 6%. Two foundation design alternatives are applicable, namely (i) conventional strip foundations or (ii) slab-on-the-ground foundations, to be placed directly on bedrock or very dense pedocrete.

Geotechnical Zone II

Zone classed as R (founding is stable and expected soil movement is negligible). Slope across the site is approximately between 2 – 6%. Due to the geotechnical conditions on site, two founding options are applicable to the site, namely (i) conventional strip foundations or (ii) slab-on-the-ground foundations, to be placed directly on bedrock or very dense pedocrete.

Geotechnical Zone III

Zone classed as S (founding is stable and less than 10mm rapid compression settlement is expected). Slope across the site is approximately between 2 – 6%. Two foundation design alternatives are applicable, namely (i) conventional strip foundations or (ii) slab-on-the-ground foundations, to be placed directly on the medium dense to very dense residual soil or pedocretes.



AREA	AREA OF PROPERTY (%)	GEOTECHNICAL CLASS	ESTIMATED SOIL MOVEMENT (mm)	SOIL PROFILE	CONSTRUCTION TYPE	FOUNDATION DESIGN	ASSOCIATED PROBLEMS	DEVELOPMENT POTENTIAL
I	40,06	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 between 2% and 6%	Intermediate
II	15,52	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.	Intermediate
III	44,42	S	0mm to 10mm compression settlement	Superficial surface horizon of colluvial sand overlying medium dense to very dense nodular calcrete and residual soil	Normal	Normal construction (strip footing or slab-on-the-ground) foundation. Founding to take place on 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%	Intermediate

Figure 26: Geotechnical characteristics of the proposed site for development. Source: Appendix 6D.

- **Undermining:**

Area is not subject to undermining.

- **Soil Corrosivity:**

All soil materials can be considered corrosive due to high soluble salt concentrations present in the material.

- **Seismicity:**

A low risk for the development of earth tremors therefore exists due to the peak ground acceleration expected in 50 years is 0.04g.

10.4.2 RECOMMENDATIONS

According to the Geo-technical Assessment, the following recommendations are given per geotechnical zone (**Appendix 6D, page 39**). According to the Geo-technical Assessment, the following recommendations are given per geotechnical zone. As the geotechnical site conditions favours the use of two foundation design alternatives, the selection of a particular foundation design must be based on practical and financial considerations. Service trenches must not be excavated parallel to buildings within 1500mm of the building perimeter.

Geotechnical Zone I and II

- These zones are both classified as R with an average bedrock or very dense pedocrete depth occurring at 200mm. Refusal of excavation occurring at a depth of 580mm. Excavations deeper than 1000m may result in 42% of the excavation being classified as hard, requiring drilling or blasting. Increasing the required depth to 1500mm will result in 61% of the excavation being classified as hard.

Geotechnical Zone III

This zone is classified as S with an average bedrock depth occurring at 740mm. Refusal of excavation occurs at a depth of 1015mm where trenches requiring excavations to depths of 1000mm, 100% of the excavation will be classified as soft, sitable for TLB. Increasing required depth to 1500mm will result in 32% of the excavation being classified as hard, requiring drilling or blasting.

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

Geotechnical Zone I

- Strip foundations of 400mm wide strip footings is the preferrable founding alternative, where footings must be placed directly on bedrock or very dense calcrete. Walls may consist of thickened floor slabs in areas where proposed dwellings do not exceed 200m^2 foundations for internal non-loadbearing walls. Should strip foundations be used, floor slabs must be reinforced with steel mesh.
- The Slab-on-the ground may require additional works (in the form of the construction of engineered fills or cutting to establish a level platform for construction) but is still considered a viable alternative.

Geotechnical Zone II

- Strip foundations of 400mm wide must be placed directly on the very dense hardpan calcrete. Walls may consist of thickened floor slabs in areas where proposed dwellings do not exceed 200m^2 foundations for internal non-loadbearing walls. Should strip foundations be used, floor slabs must be reinforced with steel mesh.
- The Slab-on-the ground is preferred method of founding. Edge beams must be placed directly on the hardpan calcrete or on medium dense *in situ*. Foundations for internal non-loadbearing walls must consist of thickened floor slabs. Foundations must not contain any changes in surface levels with steps exceeding 400mm and do not support chimneys or walls which support concrete roofs.

Geotechnical Zone III

- Reinforced strip foundations are the preferred alternative where foundations of 400mm wide are placed directly on the medium-to-dense nodular calcrete or residual soils. bedrock or very dense calcrete. Walls may consist of thickened floor slabs in areas where proposed dwellings do not exceed 200m^2 foundations for internal non-loadbearing walls. Should strip foundations be used, floor slabs must be reinforced with steel mesh.
- The Slab-on-the ground founding alternative can only be used for dwellings less than 200m^2. Edge beams shall be placed directly on medium-to-dense to dense nodular calcrete or residual soils. Foundations must not contain any changes in surface levels with steps exceeding 400mm and do not support chimneys or walls which support concrete roofs.

According to the Geotechnical Investigation, the non-perennial watercourses require no precautionary measures to ensure safety of the community against flooding. Infrastructure must be established at a safe distance from the drainage lines.

In terms of general measures, the following recommendations were made:

- **Founding**: The development must take place according to the SANS 10400H and NHBRC Home Owner's Manual Guidelines (published in 2015).
- **Trench backfill:** *in situ* materials can be used for normal backfill of trenches.
- **Layer works:** Material for sub-base and base construction must be obtained from commercial sources – depending in the pavement design, G6 or G7 material may be imported for the construction of selected layer works.
- **Wearing course for gravel roads**: material for gravel wearing coarse must be obtained from commercial sources but excavated calcrete can be stockpiled for this purpose.
- **Excavation conditions:** Due to the consistency and composition of the soil present on site, manual excavation is not considered economically viable. Excavation of soils would require a TLB (rated at 55kW minimum) or a 30 ton excavator will be required for the excavation of the very dense hardpan calcrete which needs to be removed and thus, adequate financial provision must be made for hard rock excavation. Sidewalls of excavations may be susceptible to collapse. Precautionary measures must be provided to protect workmen in these excavations - these measures may include shoring the excavations or sloping the sides to flatter than 1(V):2(H).
- **Land slope:** Average slope across 16% of the site is less than 2% which is considered as an intermediate suitability for urban development only whereas the slope of 2 – 6% on 84% of the land can be regarded as favourable for urban development.

Concerns were raised by the Engineer over potential soil and water contamination (relative to non-functioning WWTW infrastructure such as the oxidation ponds) on site which need to be resolved prior to residential development. Although the relative absence of groundwater close to the surface, along with the impermeable barrier formed by calcrete and bedrock), it is unlikely that groundwater contamination may have taken placed however, surface water (as well as soil contamination with bacteria) may have been contaminated. Should sewage dumping, present on site, be stopped, the site could be rehabilitated and the entire area can be developed accordingly. It was recommended that facilities be upgraded and residential developments must be maintained as per legal requirements and comply with recommendations stipulated in the Geotechnical Investigation.

7. SUMMARY OF IMPACTS

Please refer to Appendix 7 for a summary of the project impact assessment and significance, including a summary of mitigation measures.

Table 5 is a summary of all the impacts assessed in the specialists reports that are associated with the construction and operational phase for the preferred alternative.

Table 8. Summary of all impacts

Study	Impact	Significance No Mitigation	Significance With Mitigation
Botanical	**Geology & soils**: Potential impact on special habitats	Insignificant (Negative impact)	Insignificant (Negative impact)
	Land-use and cover: Potential impact on socio-economic activities.	Insignificant (Negative impact)	Insignificant (Negative impact)
	Vegetation status: Loss of vulnerable or endangered vegetation and associated habitat.	Low (Negative impact)	Insignificant (Negative impact)
	Conservation priority: Potential impact on protected areas, CBA's, ESA's or Centre's of Endemism.	Low (Negative impact)	Insignificant (Negative impact)
	Connectivity: Potential loss of ecological migration corridors.	Low (Negative impact)	Insignificant (Negative impact)
	Protected & endangered plant species: Potential impact on threatened or protected plant species.	Medium (Negative impact)	Insignificant (Negative impact)
	Invasive alien plant species: Potential invasive plant infestation as a result of the activities.	Insignificant (Negative impact)	Insignificant (Negative impact)
	Veld fire risk: Potential risk of veld fires as a result of the activities.	Insignificant (Negative impact)	Insignificant (Negative impact)
	Cumulative impacts: Cumulative impact associated with proposed activity.	Low (Negative impact)	Insignificant (Negative impact)
	The "No-Go" option: Potential impact associated with the No-Go alternative.	Medium (Negative impact)	N/A
Heritage	No significant heritage sites or features were identified within the proposed site for development. Ten incidences of	Low (No mitigation required)	

	ESA/MSA/LSA lithic material and low-fired indigenous ceramics were recorded across the development footprint.		
	The formal Grootdrink town cemetery, situated outside of the development footprint.	Low (No mitigation required)	
Palaeontology	Due to the low palaeontological significance of the area, no further palaeontological heritage studies, ground-truthing and/or specialist mitigation are required.	N/A	N/A
Freshwater	**Cumulative impact** of sewage and solid waste ending up in the drainage line and Orange River	Medium (Negative impact)	Low (Negative impact)
	Impact of graveyards on the drainage line riparian zone	Medium (Negative impact)	Low (Negative impact)
	Animal husbandry (i.e. overgrazing and trampling)	Medium (Negative impact)	Low (Negative impact)
Socio-economic	Job Creation – Construction phase	Medium (Positive impact)	
Visual	Potential visual impact on the area	Low (Negative impact)	Low (Negative impact)
Dust	Potential impact of dust from construction activities	Low (Positive impact)	Low (Positive impact)

8. RECOMMENDATIONS

The following mitigation measures must be enforced if the proposed development were approved. These are also included in the Environmental Management Programme (**Appendix 9**).

Construction Phase:
According to the Botanical Assessment (**Appendix 6A**), the following mitigation actions are recommended:

- 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
- **Before any work is done** search & rescue
- 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).

According to the Heritage Impact Assessment (**Appendix 6B**), 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:

- No significant heritage sites or features were identified within the proposed Grootdrink development footprint. No further mitigation is required for the proposed development on these properties. Therefore, from a heritage point of view, we recommend that the proposed development can continue.
- The Early/Middle Stone Age and 20th-century cultural material identified proposed Grootdrink development footprint, is situated outside the development footprint and is not conservation worthy. No further mitigation is recommended with regards to these resources.
- The Grootdrink cemetery is situated outside the development footprint. The site is graded as IIIB and is of High Local Significance. It is recommended that the graves be fenced off with the inclusion of a 50 m buffer/safety zone.
- 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).

- 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.

According to the Freshwater Impact Assessment (**Appendix 6C**), based on the assessment of the potential impact of the development on the identified heritage, recommendations made by the Freshwater Specialist include re-instating municipal services such as waste collection, waste disposal and proper sewage treatment. Construction must be undertaken in the dry season, limiting the footprint and vegetating the disturbed areas. A formal cemetery should also be provided. The impact of animal husbandry (associated with overgrazing) and trampling by humans of drainage lines must be reduced.

As per the geotechnical site conditions favours the use of two foundation design alternatives, the selection of a particular foundation design must be based on practical and financial considerations. Service trenches must not be excavated parallel to buildings within 1500mm of the building perimeter. In terms of general measures, the following recommendations were made:

- **Founding**: The development must take place according to the SANS 10400H and NHBRC Home Owner's Manual Guidelines (published in 2015).
- **Trench backfill:** *in situ* materials can be used for normal backfill of trenches.
- **Layer works:** Material for sub-base and base construction must be obtained from commercial sources – depending in the pavement design, G6 or G7 material may be imported for the construction of selected layer works.
- **Wearing course for gravel roads**: material for gravel wearing coarse must be obtained from commercial sources but excavated calcrete can be stockpiled for this purpose.
- **Excavation conditions:** Due to the consistency and composition of the soil present on site, manual excavation is not considered economically viable. Excavation of soils would require a TLB (rated at 55kW minimum) or a 30 ton excavator will be required for the excavation of the very dense hardpan calcrete which needs to be removed and thus, adequate financial provision must be made for hard rock excavation. Sidewalls of excavations may be susceptible to collapse. Precautionary measures must be provided to protect workmen in these excavations - these measures may include shoring the excavations or sloping the sides to flatter than 1(V):2(H).
- **Land slope:** Average slope across 16% of the site is less than 2% which is considered as an intermediate suitability for urban development only whereas the slope of 2 – 6% on 84% of the land can be regarded as favourable for urban development.

Concerns were raised by the Engineer over potential soil and water contamination (due to cemetery, obsolete oxidation dams, existing oxidation dams, and sewage dumping area) on site which need to be resolved prior to residential development. Although the relative absence of groundwater close to the surface, along with the impermeable barrier formed by calcrete and bedrock), it is unlikely that groundwater contamination may have taken placed however, surface water (as well as soil contamination with bacteria) may have been contaminated. Should sewage dumping, present on site, be stopped, the site could be rehabilitated and the entire area can be developed accordingly. It was recommended that facilities be upgraded and residential developments must be maintained as per legal requirements and comply with recommendations stipulated in the Geotechnical Investigation.

Operational Phase:

According to the Freshwater Assessment, the lack of a functional WWTW and adequate solid waste management plan remains a cause of concern which may negatively impact the proposed site for development. Therefore, a proper municipal waste management system will be required.

9. CONCLUSIONS

The following specialist studies were undertaken as part of this Environmental Impact Assessment:

- Botanical Impact Assessment (**Appendix 6A**)
- Heritage Impact Assessment (**Appendix 6B**)
- Freshwater Assessment (**Appendix 6C**)
- Geo-technical Assessment (**Appendix 6D**)

The specialist studies and the information provided within the EIA Report, indicates that the proposed Grootdrink Housing development does not pose any significant impacts and can be implemented with appropriate mitigation. However, as per the specialist assessments, site visits, and comments received from registered I&APs, the lack of adequate sewerage management and illegal solid waste dumping remains key issues which must be addressed with the implementation of a proper waste management plan. The proposed project will increase the pressure placed on existing municipal services and therefore, if a waste management plan is not effectively implemented, the current lack of sewage treatment and solid waste removal may negatively impact the environment and socioeconomic development in the Grootdrink area.

In terms of the need and desirability of the proposed residential development, housing is a national need, including in the !Kheis Local Municipality. The proposed development represents a significant step towards service delivery and housing objectives within the municipality and broader area. The development will not only meet the pressing needs of adequate housing within the municipality but will also be in line to support of the municipal IDP and SDF objectives, namely to provide housing for the poor and decrease the Municipality's housing backlog as well as fulfil the Constitutional mandate to provide adequate housing and basic services to citizens.

The proposed location is considered to be a viable option. The proposed site is adjacent to the existing residential area of Grootdrink, allowing accessibility and linking to the existing and future services infrastructure. The surrounding land use, namely the existing Grootdrink settlement, is in line with the proposed development, which is part of the reasons why this location was selected by the local authority for the purposes of this project. The site can be accessed using the existing road networks in the area.

There are no physical characteristics of these properties or environmental constraints which would exclude the site from development. However, as per the Botanical Assessment, numerous nationally and provincially protected plant species are present within the development footprint. Prior to any of these protected plant species being disturbed, damaged, removed, relocated, or destroyed, a permit from the relevant authority is required and must be applied for.

In terms of alternatives, **Alternative 4** is the preferred alternative. This alternative is considered a viable option and is also the Municipality's preferred layout since it provides the optimal number of erven and housing opportunities, as well as providing for Municipal and Government land use opportunities, and more Open Space to provide buffers on the existing drainage lines present within the proposed site for development and incorporates the environmental sensitive areas associated with the site. There are no environmental or heritage limitations to this layout.

The "no-go" option, which is the option of not developing the proposed housing development. Currently, the area earmarked for development is disturbed, with numerous cases of illegal dumping and inadequate

sewerage management practices (i.e. use of VIPs or conservancy tanks where the increase in households will increase pressure on Municipal services (i.e. use of honey suckers) to service conservancy tanks). Although the no-go development might result in no potential negative environmental impacts, especially on the clearance of vegetation on the development site, 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 area will not be realised.

According to the Botanical Impact Assessment (Appendix 6A), the proposed Grootdrink development is expected to permanently transform approximately 36ha of land, of which approximately 50 – 55% is still covered by indigenous vegetation in good condition. The site overlaps an identified CBA where five (5) Sheppard trees (*Boscia albitrunca*), and eight (8) NCNCA protected plant species were observed within the footprint.

According to the Botanical Impact Assessment, the proposed development may 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.

According to the Heritage Impact Assessment, no significant heritage sites or features were identified within the surveyed areas of the proposed Grootdrink Housing Development. No further mitigation is recommended with regards to these resources. The site is also situated and categorized as having a low palaeontological sensitivity Therefore, from a heritage point of view, the Specialists recommended that the proposed development can continue.

As per the Freshwater Assessment (**Appendix 6C**), 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. The WULA and the EIA must provide mitigation measured for these impacts. The driver of the drainage lines 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 sewage and solid waste situation may negatively impact the freshwater features of the site. The authorities may insist that these issues be resolved before a General Authorization is approved.

According to the Geo-technical Assessment, the proposed site for development was regarded as being of intermediate suitability for the proposed residential development where founding conditions were designated as R and S. No perched groundwater was encountered on site during the geotechnical investigation (and is not anticipated to be problematic on site). Groundwater is expected to occur at depths less than 15m within compact, argillaceous strata. Successful drilling for water within the proposed site for development is expected to be between 40 – 60% whereas the drilling for a borehole yielding at least 2l/s ranges between 10 – 20%.

Considering all the information, it is envisaged that this proposed Boegoeberg Housing Development will have a low negative impact on the environment, and the socio-economic benefits are expected to greatly outweigh any negative impacts. The mitigation measures, as recommended by the various specialists and detailed in the EMPr (Appendix H) must be implemented. It must be noted that a proper waste management plan, addressing the functioning of the wastewater treatment works and solid waste removal to service the proposed development (i.e. existing and increased demand for these services), must be added as a condition to the granting of the environmental authorisation. This waste management plan must be implemented to address the expected increase in pressure on existing services – as per recommendations proposed and addressed in the Engineer's Services Report (Appendix 4B). In addition to parameters stipulated in the Engineer's Services Report (Appendix 4B), a Stormwater Management Plan (SWMP) must be designed and compiled to address concerns raised by the I&AP - namely the potential flow of sewage- and/or solid waste-contaminated stormwater runoff from the development into the drainage lines and subsequently the Orange River. Therefore, it is recommended that the proposed development be supported/ authorized subject to the compilation of a SWMP which includes required engineering parameters (Appendix 4B) and the management of potentially sewage- and/or solid waste-contaminated stormwater runoff.

It is therefore recommended that the proposed Boegoeberg Housing Development (**Alternative 4**) **be supported and be authorised with the necessary conditions of approval**, namely the compilation of a stormwater management plan and waste management plan (addressing sewage and solid waste management), along with the implementation of recommendations / mitigation measures proposed by Specialists (Appendices 6A-D) and included in the EMPr (Appendix 9).

10. DETAILS AND EXPERTISE OF THE EAP

Details of Environmental Assessment Practitioner, expertise and Curriculum Vitae

This Final Environmental Impact Report was Report compiled by Anthony Mader -

Qualifications:
Anthony Mader: BSc, BSc (Hons), PhD (currently completing) at the University of the Witwatersrand, Johannesburg, South Africa.

Expertise:
Anthony has over three years of experience within environmental consulting and has worked on private and government projects throughout the country, including Western Cape, Northern Cape, KwaZulu-Natal, and the Eastern Cape. Anthony has facilitated Environmental (EA) and Water Use (WUA) applications whereas other duties included auditing of various types of construction types to ensure environmental compliance with the EA. The variety of projects Anthony has worked on include, but are not limited to;

- Housing developments;
- Civil engineering infrastructure projects such as water supply schemes, roads, culverts, bridges, warehouses, and a substation; and
- Auditing of water supply schemes, housing developments, warehouses, roads, bridges, and reservoirs

Anthony Mader joined EnviroAfrica CC in March 2020 and is employed as an Environmental Assessment Practitioner (EAP), working on various private and government projects throughout the Western Cape and Northern Cape.

Employment:

Previous employment as an Environmental Consultant	**:**	**EnviroPro Environmental Consultants (2017 – 2020)**
Current employment as Environmental Assessment Practitioner	**:**	**EnviroAfrica cc (2020 – present).**

Report reviewed and supervised by Bernard de Witt – The whole process and report was supervised by Bernard de Witt who has more than 30 years' experience in environmental management and environmental impact assessments. Bernard de Witt: B.Sc. Forestry (Stellenbosch); B.A. (Hons) Public Administration (Stellenbosch); National Diploma in Parks and Recreation Management; EIA Short course (UCT); ISO 14001 Auditors course (SABS)

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