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Environmental Conditions to be Included in the Tender:

Installation of a pipeline and pump station on Farm Kgotsong No 1195, portion 0, and Farm Botharnia No.9 portion 0 Bothaville

As per section 24N subsection 7 of NEMA (Act no. 107 of 1998, S. 24N.7):

> 7. The **holder** and any person issued with an **environmental authorisation**-
> (c). **must manage** all **environmental impacts**—
> (i). **in accordance with** his or her **approved environmental management programme**, where appropriate.

Thus, the recipient of tender shall take responsibility of the implementation of all of the conditions (where appropriate) as stipulated in the approved environmental management programme (EMPr).

The EMPr has been compiled in conjunction with the findings of a Basic Assessment Report process. Mitigations have been implemented in line with the findings of the Environmental Assessment Practitioner as well as specialist reports conducted in assessment of the various environmental implications of the construction of a rising main and pumpstation. The specialist reports included a/an:

- Aquatic Biodiversity Theme Site Sensitivity Verification and Compliance Statement.
- Phase 1 Heritage Impact Assessment.
- Site Sensitivity and Terrestrial Ecology Compliance Statement Report.

The conditions as outlined in the EMPr includes consideration of the following factors:

8.1. Social environmental issues
8.2. Boundary demarcation
8.3. Clearing and grubbing
8.4. Establishing office / camp sites
8.5. Waste management
8.6. Air quality, noise and vibrations
8.7. Fire control
8.8. Erosion control
8.9. Contamination of land
8.10. Surface and ground water quality
8.11. Water usage
8.12. Fauna and flora
8.13. Historical archaeological and heritage impacts
8.14. Access roads
8.15. Rehabilitation
8.16. Handling of emergencies
8.17. Access restricted areas

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Pertinent conditions of the EMPr implicates that:

- The contractor will be responsible for the erection and subsequent complete removal of a fenced construction camp as well as all necessary environmental rehabilitation following the disbandment of site.
- Potential implementation of geotextiles to facilitate in erosion control in areas sensitive to erosion (nearing ephemeral watercourses).
- The potential implementation of a chance finds protocol in the incidence of improbable chance discoveries of heritage or palaeontological significance.
- The contractor will be responsible for continual environmental maintenance (includes erosion control, and alien invasive plant management), active rehabilitation including revegetation of cleared and grubbed areas.
- The site will require monthly environmental audits and inspection by a competent ECO.

The contractor shall also be responsible to abide by all relevant environmental legislation such as:

- The National Water Act (36 of 1998).
- The National Environmental Management Act (Act no. 107 of 1998).
- National Environmental Management: Biodiversity Act (Act no. 10 of 2004).

Environmental Management Group (Pty) Ltd.

EMPr for:

the proposed pumpstation and pipeline installation at Bothaville, Free State, South Africa.

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ENVIRONMENTAL MANAGEMENT PROGRAMME

in terms of the

National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended & Environmental Impact Assessment Regulations 2014

Submitted for:

Stakeholder Review & Comment

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DEFINITIONS:

Alien Vegetation: alien vegetation is defined as undesirable plant growth which shall include, but not be limited to; all declared category 1 and 2 listed invader species as set out in the Conservation of Agricultural Resources Act (CARA) regulations. Other vegetation deemed to be alien shall be those plant species that show the potential to occupy in number, any area within the defined construction area and which are declared to be undesirable.

Aspect: Element of an organisation's activities, products or services that can interact with the environment.

Auditing: A systematic, documented, periodic and objective evaluation of how well the environmental management plan is being implemented and is performing with the aim of helping to safeguard the environment by facilitating management control which would include meeting regulatory requirements. Results of the audit help the organisation to improve its environmental policies and management systems.

Built environment: Physical surroundings created by human activity, e.g. buildings, houses, roads, bridges and harbours.

Contamination: Polluting or making something impure.

Corrective (or remedial) action: Response required addressing an environmental problem that is in conflict with the requirements of the EMPr. The need for corrective action may be determined through monitoring, audits or management review.

Degradation: The lowering of the quality of the environment through human activities, e.g. river degradation, soil degradation.

Ecology: The scientific study of the relationship between living things (animals, plants and humans) and their environment.

Ecosystem: The relationship and interaction between plants, animals and the non-living environment.

Environment: The surroundings within which humans exist and that could be made up of -

- the land, water and atmosphere of the earth;
- micro-organisms, plant and animal life;
- any part or combination of the two points mentioned above and the interrelationships among and between them; and
- the physical, chemical, aesthetic and cultural properties and conditions of the foregoing that influence human health and well-being.

Environmental aspect: Any component of a contractor's construction activity that is likely to interact with the environment.

Environmental impact: or impact is the change to the environment, whether desirable or undesirable, that will result from the effect of a construction activity. An impact may be the direct or indirect consequence of a construction activity.

Environmental authorisation: A written statement from the National Department of Forestry, Fisheries and the Environment (DFFE) that records its approval of a planned development.

Hazardous waste: Waste, even in small amounts, that can cause damage to plants, animals, their habitat and the well-being of human beings, e.g. waste from factories, detergents, pesticides, hydrocarbons, etc.
Land use: The use of land for human activities, e.g. residential, commercial, industrial use.
Mitigation: Measures designed to avoid, reduce or remedy adverse impacts

1. INTRODUCTION AND BACKGROUND:

1.1. Scope:

Environmental Management Group (EMG) (Pty) Ltd, as independent environmental managers and impact assessors has been appointed by **BVi consulting engineers** to compile and submit an Environmental Management Programme (EMPr) under the National Environmental Management Act No 107 of 1998, for the **proposed pumpstation and rising pipeline in Bothaville, Free State** as part of the Environmental Authorisation Process.

This document is compiled in accordance with the Integrated Environmental Management (IEM) philosophy which aims to achieve a desirable balance between conservation and development (DEAT, 1992). IEM is a key instrument of the National Environmental Management Act [NEMA] (Act No. 107 of 1998). NEMA promotes the integrated environmental management of activities that may have a significant effect on the environment, while IEM prescribes a methodology for ensuring that environmental management principles are fully integrated into all stages of the development process. It advocates the use of several environmental management tools that are appropriate for the various levels of decision-making. One such tool is an EMPr. The IEM guidelines encourage a pro-active approach to sourcing, collating and presenting information in a manner that can be interpreted at all levels. The basic principles underpinning IEM are that there be:

- informed decision-making;
- accountability for information on which decisions are taken;
- accountability for decisions taken;
- a broad meaning given to the term environment (i.e. one that includes physical, biological,
- social, economic, cultural, historical and political components);
- an open, participatory approach in the planning of proposals;
- consultation with interested and affected parties;
- due consideration of alternative options;
- an attempt to mitigate negative impacts and enhance positive aspects of proposals;
- an attempt to ensure that the 'social costs' of development proposals (those borne by society, rather than the developers) be outweighed by the 'social benefits' (benefits to society as a result of the actions of the developers);
- democratic regard for individual rights and obligations;
- compliance with these principles during all stages of the planning, implementation and decommissioning of the proposals (i.e. from 'cradle to grave');
- and the opportunity for public and specialist input in the decision-making process.

The Environmental Impact Assessment Regulations that took effect in December 2014 regulate the procedures and criteria for the submission, processing, consideration and decision on applications for environmental authorisation of listed activities.

The general principles contained within this document apply to the **planning** and **construction phase** activities regarding the proposed development.

1.2. Project description:

Environmental Management Group (Pty) Ltd has been appointed by BVi Consulting Engineers Central (Pty) Ltd (Consulting Engineer) on behalf of the Nala Local Municipality (Applicant) as an independent environmental assessment practitioner to conduct the Basic Assessment (BA) process concerning the proposed installation of a pipeline and pump station on Farm Kgotsong No 1195, portion 0, and Farm Botharnia No.9 portion 0 Bothaville, Free State. The BA process is being carried out in compliance with the EIA Regulations 2014 (amended), which have been promulgated in accordance with the National Environmental Management Act (NEMA: Act No. 107 of 1998). A report was compiled by BVi Consulting Engineers in response to being hired by Nala Local Municipality for
professional engineering services in which it was identified that due to:

- the planned development known as Botharnia phase 2,
- the historic growth of the Kgotsong Township and Bothaville,
- the anticipated formalization of erven within the Kgotsong township in an area referred to as Two-Rooms,
- the potential for further industrial development on the eastern side of Bothaville,

that additional municipal services will be necessitated to accommodate the increased demand. Hence, the main objective of the proposed development is to construct a pump station and pipeline to accommodate the sewage from these areas.

The pumpstation would be situated on the northern side of the R727 in between the town of Bothaville and the settlement of Kgotsong refer to (Figure 1). This location was strategically chosen on account of several factors namely:

- the positioning between Bothaville and Kgotsong allows for efficient service coverage.
- the ease of connectivity to existing outfall lines,
- ease of future expansion of sewer infrastructure in the anticipated growth in residential and mixed-use developments,
- ease of connectivity to the existing pump station network in the incidence of future necessity due to growth.

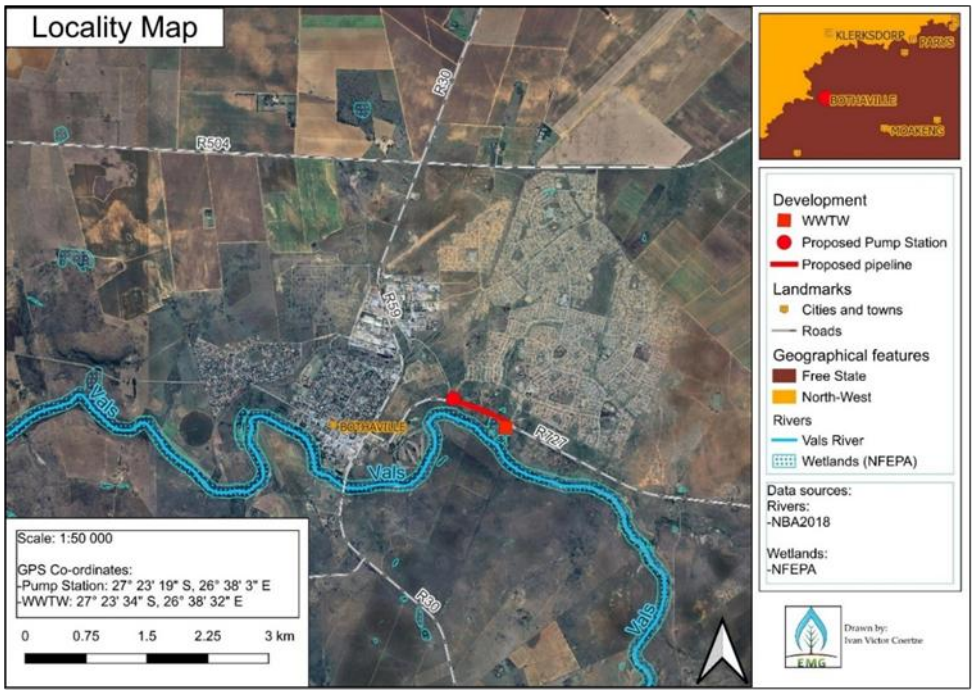

Figure 1: Locality map of the proposed development.

The proposed pipeline would stretch eastward from the pumpstation along the R727 where it would eventually cross underneath the R727 to connect to the existing wastewater treatment works on the south of the R727. The pipeline would cross over several observed watercourses that lead underneath the R727 to the Vals River (Figure 2).

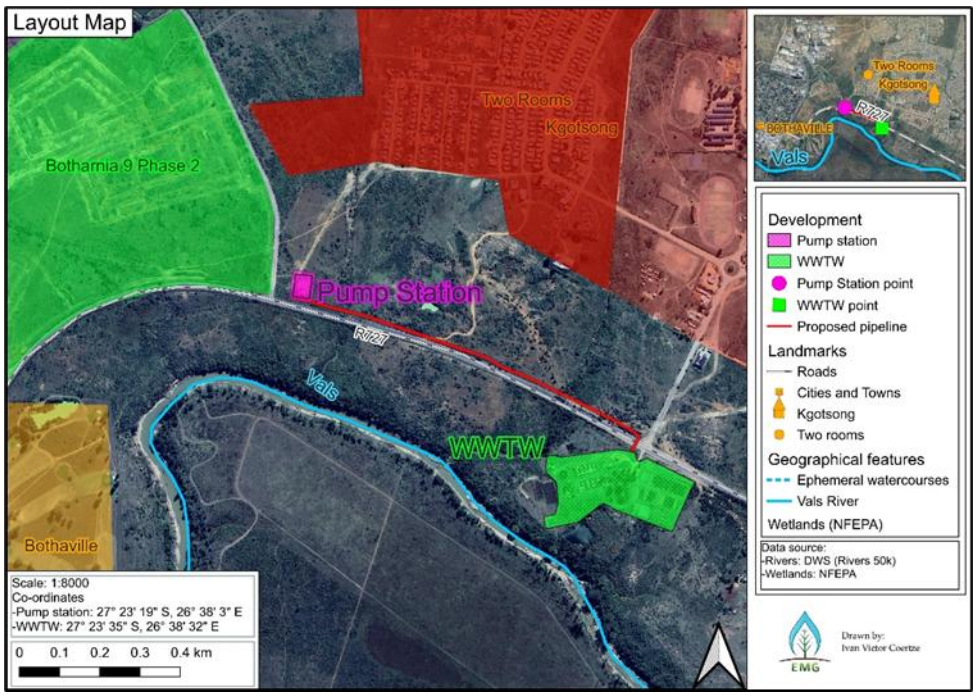

Figure 2: Layout map of the proposed development.

The anticipated throughput of sewage from Botharnia Phase 2 and Two Rooms is estimated to be a total of 11.643l/s as calculated using the Redbook, SANS 0400 and SANS 0252-2:1994 according to the different anticipated property types (Table 1).

Table 1: The anticipated design flow (Redbook, SANS 0400 and SANS 0252-2:1994) of the currently projected developments.

Currently projected throughput	
Erven Type	**Design flow amount (l/s)**
Two Rooms	
Residential	1.449
Botharnia 9 Phase 2	
Residential	7.681
Business	1.684
Educational	0.444
Municipal	0.091
Church	0.292
Sum total (l/s)	**11.643**

Additionally, a new potential industrial development on the eastern side of the Bothaville may, if the need arises in the future, be connected to the Botharnia 9 phase 2 pump station as well. This development is anticipated to produce a throughput of sewage of 10.478l/s.

The total throughput of sewage which will be pumped from the proposed Botharnia pumpstation to the WWTW will be 1.005Ml/day (24hours X 60minutes X 60seconds X 11.643l/s). If the potential industrial complex will also be connected to the proposed Botharnia Pump Station, then the throughput that will be pumped to the WWTW will be 1.911Ml/day (24hours X 60minutes X 60seconds X 22.121l/s).

Pump house construction:

Two outfall pipelines, (one already constructed and the other designed by the previous service provider), will be connected to the pump station. One sourcing sewage from a neighbourhood within Kgotsong called 'Two Rooms', and the other from Botharnia 9 phase 2. The pump house will be a brick construction (330 mm cavity bricks) with a reinforced concrete roof. The pump house will contain two new submersible pumps installed within wet wells constructed to a depth of approximately 5m for enhanced emergency storage capacity. The system will provide 4 hours of emergency storage based on average sewage flow to prevent overflow onto adjacent land. Water stops and sealing measures will be in place to prevent leakage. Construction will entail a 20m wide strip cleared of vegetation, trees and rubble around the fence line to facilitate construction activities. The surface area for the pump station building will be 2285.13m^2 (Figure 3). The total anticipated surface area for the pump station including the 20m clearance strip will be 4367.95m^2. Thus,
given its proximity to nearby watercourses, it is anticipated that the proposed development will trigger Listing Notice 3 of the EIA Regulations, 2014 as amended, activity 12(b)(iv).

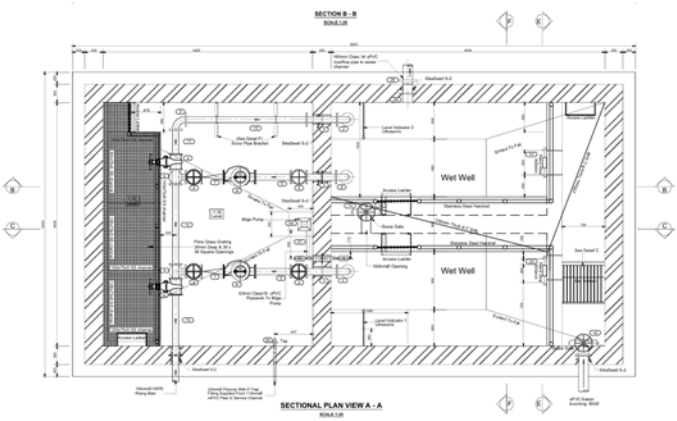

Figure 3: Engineers drawing of the pump station from the ariel view illustrating the two wet wells proposed to be constructed in the pumpstation.

Rising main pipeline construction:

The current projected throughput, excluding the possibility of the additional Bothaville industrial development connection, is anticipated to be 11.643l/s. If the potential industrial development is connected, then the throughput is anticipated to be 22.121l/s. A pipeline is thus anticipated to be constructed. The materials to be used is currently being discussed and clarified with the department of water and sanitation (DWS) to ensure that all DWS requirements are met. It is currently anticipated that the pipeline will be constructed using a combination of HDPE and uPVC pipe. uPVC pipe is anticipated to be used for the majority of the length of the pipeline. The areas within 100m of identified watercourses will be HDPE (Figure: 4).
This will entail the pipeline comprising of 5 stretches constructed alternating between uPVC and HDPE:
1. 27° 23' 20" S, 26° 38' 3" E to 27° 23' 20" S, 26° 38' 4" E: UPVC
2. 27° 23' 20" S, 26° 38' 4" E to 27° 23' 22" S, 26° 38' 11" E: HDPE
3. 27° 23' 22" S, 26° 38' 11" E to 27° 23' 26" S, 26° 38' 24" E: UPVC
4. 27° 23' 26" S, 26° 38' 24" E to 27° 23' 29" S, 26° 38' 30" E: HDPE
5. 27° 23' 29" S, 26° 38' 30" E to 27° 23' 31" S, 26° 38' 33" E: UPVC

Specialist studies have been conducted for the site as follows:

Aquatic Ecological Assessment – Mr. AJH Lambrecht (EcoFocus Consulting Services)
Phase 1 Heritage Impact Assessment – Dr L Rossouw (Paleo Field Services)
Terrestrial Ecological Impact Assessment – Ms. E Ferreira and Mr. R Nel (Environmental Management Group).

2. ROLE PLAYERS AND RESPONSIBILITY MATRIX:

In order for the EMPr to be successfully implemented, all the role players involved in the project need to co-operate. For this to happen, role players must clearly understand their roles and responsibilities in the project, must be professional, form respectful and transparent relationships, and maintain open lines of communication.

Table 3: Functions and Responsibilities of Project Team

Key	Function	Responsibility
P	Proponent	Proponent is ultimately accountable for ensuring compliance to the EMPr. The ECO must be contracted by the Proponent (full time or part time depending on the size of the project) as an independent appointment to objectively monitor implementation of relevant environmental legislation, conditions of the EMPr for the project. The Proponent is further responsible for providing and giving mandate to enable the ECO to perform responsibilities. The developer must ensure that the ECO is integrated as part of the project team.
CE	Consulting Engineer	Contracted by the developer to design and specify the project engineering aspects. Generally, the engineer runs the works contract. The CE may also fulfil the role of Project Manager on the proponent's behalf (See PM).
PM	Project Manager	The Project Manager has over-all responsibility for managing the project, contractors, and consultants and for ensuring that the environmental management requirements are met. The CE may also act as the PM. All decisions regarding environmental procedures must be approved by the PM. The PM has the authority to stop any decommissioning activity in contravention of the EMPr in accordance with an agreed warning procedure.
ER	Engineer's Representative	The consulting engineer's representative on site. Has the power/mandate to issue site instructions and in some instances, variation orders to the contractor, following request by the EO or ECO. The ER oversees site works, liaison with Contractor and ECO.
EO/EM	Environmental Officer / Environmental Manager	Appointed by the Consulting Engineers as their environmental representative on site. The EO is not independent but must rather act on behalf of the consulting engineers with the mandate to enforce compliance under the project contract, which must include the EMPr. The EO has the directive to issue non-conformance and hazard certificates. Further, in terms of accepted industry practice the EO could issue the equivalent of a "cease works" instruction only in exceptional circumstances where serious environmental harm has been or is about to be caused i.e. in cases of extreme urgency and then only when the ER is absent. The EO must form part of the project team and be involved in all aspects of project planning that can influence environmental conditions on the site. On certain types of projects, such as linear developments (fences, pipelines, etc),

		the EO must also be the liaison between the contractor and landowners. The EO must attend relevant project meetings, conduct daily inspections to monitor compliance with the EMPr, and be responsible for providing reports and feedback on potential environmental problems associated with the development to the project team and ECO. The EO must convey the contents of this EMPr to the Contractor site team and discuss the contents in detail with the Contractor as well as undertake to conduct an induction and an environmental awareness training session prior to site handover to all contractors and their workforce. The EO must be suitably experienced with the relevant qualifications and preferably competent in construction related methods and practices.
ECO	Environmental Control Officer	An independent appointment to objectively monitor implementation of relevant environmental legislation, conditions of Environmental Authorisations (EA's), and the EMPr for the project. The ECO must be on site prior to any site establishment and must endeavour to form an integral part of the project team. The ECO must be proactive and have access to specialist expertise as and when required, these include botanists, ecologists, etc. Further, the ECO must also have access to expertise such as game capture, snake catching, etc. The ECO must conduct audits on compliance to relevant environmental legislation, conditions of EA, and the EMPr for the project. The size and sensitivity of the development, based on the EIA, will determine the frequency at which the ECO will be required to conduct audits. (A minimum of a monthly site inspection must be undertaken). The ECO must be the liaison between the relevant authorities and the project team. The ECO must communicate and inform the developer and consulting engineers of any changes to environmental conditions as required by relevant authoritative bodies. The ECO must ensure that the registration and updating of all relevant EMPr documentation is carried out. The ECO must be suitably experienced with the relevant environmental management qualifications and preferably competent in construction related methods and practices. The ECO must handle information received from whistle blowers as confidential and must address and report these incidences to the relevant Authority as soon as possible. On small projects, where no EO is appointed, the ECO must convey the contents of this EMPr to the Contractor site team and discuss the contents in detail with the Contractor as well as undertake to conduct an induction and an environmental

		awareness training session prior to site handover to all contractors and their workforce.
C	Contractor	The principal contractor, hereafter known as the 'Contractor', is responsible for implementation and compliance with the requirements of the EMPr and conditions of the EA's, contract and relevant environmental legislation. The Contractor must ensure that all sub-contractors have a copy of and are fully aware of the content and requirements of this EMPr. The contractor is required, where specified, to provide Method Statements setting out in detail how the management actions contained in the EMPr will be implemented.
ESO	Environmental Site Officer	The ESO is employed by the Contractor as his/her environmental representative to monitor, review and verify compliance with the EMPr by the contractor. This is not an independent appointment; rather the ESO must be a respected member of the contractor's management team. Dependent on the size of the development the ESO must be on site one week prior to the commencement of construction. The ESO must ensure that he/she is involved at all phases of the constriction (from site clearance to rehabilitation).
A	Lead Authority	The authorities are the relevant environmental department that has issued the Environmental Authorisation. The authorities are responsible for ensuring that the monitoring of the EMPr and other authorisation documentation is carried out, this will be achieved by reviewing audit reports submitted by the ECO and conducting regular site visits.
OA	Other Authorities	Other authorities are those that may be involved in the approval process of an EMPr. Their involvement may include reviewing EMPrs to ensure the accuracy of the information relevant to their specific mandate. Other authorities may be involved in the development, review or implementation of an EMPr. For example, if a specific development requires a water use licence for the relevant national authority, then that authority should review and comment on the content of the particular section pertaining to that mandate.
EAP	Environmental Assessment Practitioner	The definition of an environmental assessment practitioner in Section 1 of NEMA is "*the individual responsible for the planning, management and coordination of environmental impact assessments, strategic environmental assessments, environmental management plans or any other appropriate environmental instruments introduced through regulationsò*

3. OBJECTIVES OF THE EMPR:[1]

The specific objectives of this EMPr are to:

- To provide explicit operational guidelines and environmental monitoring requirements during the construction phases so that activities are done in an environmentally responsible and sustainable manner.
- To benefit the host communities, minimise the impacts on the environment and to ensure the health and safety of the community by creating a development that eliminates unacceptable health hazards and ensures public and animal safety.
- To enable proponent and its contractors to use resources efficiently and effectively during the project lifecycle in order to reduce wastage and thereby reduce associated negative environmental impacts. In addition, the aim is also to handle waste streams responsibly and apply the 'reduce, re-use and recycle' principle, wherever possible
- To leave areas disturbed by construction in a rehabilitated, stable, non-polluting and tidy condition.

4. ACTIVITIES COVERED BY THE EMPR:

4.1. Planning stage:

The project planning stage consists of layout design surveying and ensuring that all plans and required contracts, permits/ licenses and agreements are set in place.

4.2. Construction phase:

The construction phase will start after the relevant authorisations are granted. The construction phase involves earthwork, structure development, service provision and finishing. The construction phase will start after the relevant authorisations are granted. This phase includes:

- Establishment of construction camp and equipment yards
- Transportation of construction material and other resource inputs;
- Use of construction equipment on site;
- Storage of input materials and disposal of waste generated;
- Physical clearance for the constructional purpose of the transmission line and pylon placements;
- Rehabilitation of the disturbed areas through:
    - Top-soiling and re-vegetation of areas disturbed by construction.

5. IDENTIFICATION OF ENVIRONMENTAL ASPECTS AND IMPACTS:

The contractor shall identify likely aspects before commencing with any construction activity. Examples of environment aspects include:

- Vegetation clearance

[1] The implementation of the EMPr is not an additional or "add on" requirement. The EMPr is legally binding through NEMA.

- Altering historical structures of significance
- Noise and vibration generation
- Ecological disturbance
- Landscape alteration
- Waste generation

Thereafter the contractor shall programme his work in such a way that each cause and effect of a construction activity is also identified, and the activity planned so as to prevent any impacts from happening. If prevention is not practicable, or in the event of mishap or misapplication, the contractor shall provide plans and measures for the engineer's approval, which will limit and contain the magnitude, duration and intensity of the impact. The contractor shall demonstrate that he can carry out any repair and reinstatement of the damaged environment. Listed below are some environmental impacts that could adversely alter an aspect of the environment through usual construction and operational activities:

- Pollution of atmosphere, soil or water
- Destruction or removal of fauna and flora and effect on biological diversity
- Deformation of the landscape
- Soil erosion
- Water contamination
- Effect on the built environment

6. LEGAL REQUIREMENTS:

6.1. General:

Construction and operational activities will be according to the best industry practices, as identified in the project documents. This EMPr, which forms an integral part of the contract documents, informs the contractor and applicant/manager as to his duties in the fulfilment of the project objectives, with particular reference to the prevention and mitigation of environmental impacts caused by construction activities associated with the project. The contractor and applicant/manager should note that obligations imposed by the EMPr are legally binding in terms of environmental statutory legislation and in terms of the additional conditions to the general conditions of contract that pertain to this project. In the event that any rights and obligations contained in this document contradict those specified in the standard or project specifications then the latter shall prevail.

6.2. Statutory and other applicable legislation:

The contractor and applicant/manager are deemed to have made himself conversant with all legislation pertaining to the environment, including provincial and local government ordinances, which may be applicable to the contract.

6.3. Administration of Environmental Obligations

6.3.1. Appointment of an environmental Site Officer (ESO)

For the purposes of implementing the conditions contained herein, the contractor shall submit to the engineer for approval the appointment of a nominated representative of the contractor as the ESO for the contract. The request shall be given, in writing, at least fourteen days before the start of any work clearly setting out reasons for the nomination, and with sufficient detail to enable the engineer to make a decision. The engineer will, within seven days of receiving the request, approve, reject or call for more information on the nomination. Once a nominated representative of the contractor has been approved, he/she shall be the ESO and shall be the responsible person for ensuring that the provisions of the EMPr are complied with during the life of the contract. The engineer will be responsible for issuing instructions to the contractor where environmental considerations call for action to be taken. The ESO shall submit regular written reports to the engineer, but not less frequently than once a month. The engineer shall have the authority to instruct the contractor to replace the ESO if, in the engineer's opinion, the appointed officer is not fulfilling his/her duties in terms of the requirements of the EMPr or this specification. Such instruction will be in writing and shall clearly set out the reasons why a replacement is required.

6.3.2. ESO Administration

Before the contractor begins each construction activity, the ESO shall give to the engineer a written statement setting out the following:

- The type of construction activity.
- Locality where the activity will take place.

- Identification of the environmental aspects and impacts that might result from the activity.
- Methodology for impact prevention for each activity or aspect.
- Methodology for impact containment for each activity or aspect.
- Emergency/disaster incident and reaction procedures.
- Treatment and continued maintenance of the impacted environment.

The contractor may provide such information in advance of any or all construction activities provided that new submissions shall be given to the engineer whenever there is a change or variation to the original.

The engineer may provide comment on the methodology and procedures proposed by the ESO, but he shall not be responsible for the contractor's chosen measures of impact mitigation and emergency/disaster management systems. However, the contractor shall demonstrate at inception and at least once during the contract that the approved measures and procedures function properly.

6.4. Communication Procedures on site

Each of the books described below must be available in duplicate, with copies for the Engineers Representative (ER), Environmental Site Officer (ESO) and Environmental Controlling Officer (ECO) or alternatively an agreement could be reached to use a single system. These books should be available to the authorities for inspection or on request. Contractor's meeting minutes must reflect environmental queries, agreed actions and dates of eventual compliance. These minutes form part of the official environmental record.

6.4.1. Site instruction entries

The Site Instruction Book entries will be used for the recording of general site instructions as they relate to the works on site. It will also be used for the issuing of stop work orders for the purposes of immediately halting any particular activities of the contractor in lieu of the environmental risk that they may pose.

6.4.2. ESA diary entries

The purpose of these entries will be to record the comments of the ESA as they relate to activities on the site.

6.4.3. Training

The designated environmental site officer (ESO) must be conversant with all legislation pertaining to the environment applicable to this contract and must be appropriately trained in environmental management and must possess the skills necessary to impart environmental management skills to all personnel involved in the contract. The contractor shall ensure that adequate environmental training takes place. All employees shall have been given an induction presentation on environmental awareness. Where possible, the presentation needs to be conducted in the language of the employees. The environmental training should, as a minimum, include the following:

- The importance of conformance with all environmental policies;
- The environmental impacts, actual or potential, of their work activities;
- The environmental benefits of improved personal performance;
- Their roles and responsibilities in achieving conformance with the environmental policy and procedures and with the requirement of the Agency's environmental management systems, including emergency preparedness and response requirements;
- The potential consequences of departure from specified operating procedures;
- The mitigation measures required to be implemented when carrying out their work activities.

In the case of permanent staff, the contractor shall provide evidence that such induction courses have been presented. In the case of new staff (including contract labour) the contractor shall inform the engineer when and how he intends to conclude his environmental training obligations.

7. RECORD KEEPING:

All records related to the implementation of this management plan (e.g. site instruction book and method statements) must be kept together in an office where it is safe and can be retrieved easily. These records should be kept for a minimum of two years during the construction phase and inevitably during the operational phase and should at any time be available for scrutiny by any relevant authorities.

It is recommended that photographs are taken of the site **prior to**, **during** and **immediately after construction** as a visual reference. These photographs should be stored with other records related to this EMPr.

7.1. Compliance and penalties:

The contractor shall act immediately when a notice of non-compliance is received, correct whatever is the cause for the issuing of the notice. Complaints received regarding activities on the construction site pertaining to the environment shall be recorded in a dedicated register, and the response noted with the date and action taken. Any non-compliance with the agreed procedures of the EMPr is a transgression of the various statutes and laws that define the manner by which the environment is managed; therefore, any avoidable non-compliance, dependant on severity, shall be considered sufficient grounds for contact to be made with relevant provincial or national authorities. The responsible provincial or national authorities shall ensure compliance and impose penalties relevant to the transgression as allowed for within its statutory powers.

7.2. Report availability:

Copies of this EMPr must be kept at the construction site office and will be accessible to all senior contract personnel. All personnel working on the project shall be required to familiarise themselves with the contents of this document.

8. ENVIRONMENTAL MITIGATION SPECIFICATIONS FOR IMPACTS:

8.1. Social environmental issues:

It is important to minimize any negative perception, by taking proactive measures to prevent any social conflicts or social gaps and to develop a positive attitude by the community in close proximity to and potentially involved with the project. The following management strategies are to be implemented:

- Ensure that all site personnel have a basic level of environmental awareness training prior to the commencement of the activities.
- The contractor must allow for sufficient sessions to train all personnel.
- Refresher environmental awareness training must be available as and when required.
- Training should be undertaken by a party such as the ESO who has sufficient expertise and knowledge of environmental issues.
- All staff are aware of the conditions and controls linked to the EA and within the EMPr and made aware of their individual roles and responsibilities in achieving compliance with the EA and EMPr.
- Environmental training must include as a minimum of the following;
    - Description of significant environmental impacts, actual or potential, related to their work activities;
    - Mitigation measures to be implemented when carrying out specific activities;
        - E.g. cleanup procedures in the incidence of chemical spills.
    - Emergency preparedness and response procedures;
    - Emergency procedures;
    - Procedures to be followed when working near or within sensitive areas;
    - Water usage and conservation;
    - Solid waste management procedures; and
    - Fire prevention.
- Course material must be available and presented in appropriate languages that all staff can understand.
- Recruitment and procurement should be transparent and fair. The contractor chosen should maximize the involvement of local communities in construction and support activities, to the extent possible, based on available skill levels. Whenever possible, training programmes that will benefit both construction stage skills requirements and long-term employment demand should be developed.
- The recruitment selection process should seek to promote gender equality wherever possible.
- Priority should be given to the local suppliers of goods and services, which meet requirements of project procurement as far as is possible, in order to optimize the opportunities for local businesses to supply goods and services to the project, the contractor will do a survey of the capabilities of the goods and services that are locally available that are of an acceptable standard and quality and a survey of the capabilities of local construction companies and identify opportunities for local suppliers.

- A public complaint register, and system should be in place to ensure that community complaints are clearly investigated and adequate remedial action taken should be instituted.
- Adequate notification should be done to people residing close to where construction activities are taking place especially if they are to be affected by them. In addition, there should be a system of compensation for any damages to infrastructure that may occur.
- It is the contractor's responsibility to provide the site officer with environmental training and to ensure that the site officer has sufficient understanding to pass this information onto the construction staff.
- Environmental awareness posters should be erected on site.
- Posters detailing the following should be accessible to the construction workers:
    - Dangerous snakes and reptiles
    - Procedures when encountering dangerous animals
    - Mitigation measures for the most common spills
- The need for a "clean site" policy also needs to be explained to the workers.
- Staff operating equipment (such as excavators, loaders, etc.) shall be adequately trained and sensitised to any potential hazards associated with their tasks.
- Unsocial activities such as consumption or illegal selling of alcohol, drug utilisation or selling and prostitution on site shall be prohibited. Any persons found to be engaged in such activities should receive disciplinary or criminal action taken against them.
- The site must be secured in order to reduce the opportunity for criminal activity in the locality of the construction site.
- Security personnel and skeleton staff must be supplied with adequate protective clothing, ablution facilities, water and refuse collection facilities, facilities for cooking and heating so that open fires are not necessary.
- The site and crew are to be managed in strict accordance with the Occupational Health and Safety Act, 1993 (Act No. 85 of 1993) and the National Building Regulations.
- The contractor must ensure that all emergency procedures are in place prior to commencing work. Emergency procedures must include (but not be limited to) fire, spills, contamination of the ground, accidents to employees, use of hazardous substances and materials, etc.
- Each worker should be required to abide by a Code of Conduct which will limit unsavoury activities in local towns and communities and restrict certain behaviours in the work sites and accommodation.

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8.2. Boundary demarcation:

- The campsite and construction area shall be suitably secured to prohibit casual access and promote the safety of staff and on-site persons.

- No unauthorised pedestrian or vehicular access shall be allowed into demarcated limits areas.
- Any gates must be fitted with locks and be kept locked at all times during the construction phase.
- Fencing must be erected around the construction camp, hazardous storage areas, and all designated access restricted areas, where appropriate and should not cause harm to the sensitive flora.
- The use of razor wire as fencing must be avoided.
- Fenced areas with gate access must remain locked after hours, during weekends and on holidays if staff is away from site.
- Site security will be required at all times.
- On completion of the construction phase all temporary fences are to be removed.
- The contractor must ensure that all fence uprights are appropriately removed, ensuring that no uprights are cut at ground level but rather removed completely.
- Fencing shall be kept neat at all times. The contractor shall be responsible for the maintenance of all fences.
- If temporary fencing is removed temporarily for the execution of work, the contractor shall reinstate it as soon as practicable.
- Breaches in the fencing must be repaired immediately.
- The purpose of the fenced areas is to control construction, and personnel activity within the designated areas and limit unauthorised access.
- No fences or gates that provide access to the site/construction campsite may be cut, lowered, removed or damaged in any way.
- All unattended trenches/ excavations should be demarcated or fenced off.

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8.3. Clearing and grubbing:

- All necessary permits and licenses must be in place before the commencement of activities may take place.
- Contractor shall at all times carefully consider what machinery is appropriate to the task while minimising the extent of environmental damage.
- Clearance of vegetation should be restricted to the authorised development boundary.
- Adequate operational procedures for construction machinery and equipment must be developed in order to strictly govern and restrict movement of machinery only within the proposed development construction footprint area and to ensure environmentally responsible construction practices and activities.
- The proposed linear development footprint area at the two identified significant ephemeral watercourse crossings must be kept as narrow as practicably possible to reduce the surface impact on the features.

- Vegetation clearance must be restricted to the narrow linear route of the proposed pipeline, as far as practicably possible.
- No site construction basecamps may be established within the surrounding undeveloped landscape.
- The topsoil is regarded as the top 500 mm of the soil profile (in the area of Bothaville) irrespective of the fertility appearance.
- Topsoil is to be stripped when it is in as dry a condition as possible in order to prevent compaction.
- The topsoil, including the existing grass cover is to be shallowly ripped (only the depth of the topsoil) before removal. This is to ensure that organic plant material, and the natural seed base is included in the stripping process.
- As far as is possible, vegetation should be retained to prevent any unnecessary loss of species as well as to prevent soil erosion.
- Cleared indigenous vegetation should be mulched for use in rehabilitation.
- All material that is excavated during the project development phase (either during piling (if required) or earthworks) must be stored appropriately on site in order to minimise impacts to watercourses, watercourses and water bodies.
- The topsoil layer in the areas that will undergo trenching should be excavated and stored in stockpiles separately to the underlying soil.
- Topsoil should not be accidentally mixed with waste or other contaminants.
- Soil stockpiles shall not be higher than 2 m or stored for a period longer than one year.
- The slopes of soil stockpiles shall not be steeper than 1m vertical to 2m horizontal.
- No vehicles shall be allowed access onto the stockpiles after they have been placed.
- Stockpiles shall not be allowed to become contaminated with oil, diesel, petrol, garbage or any other material, which may inhibit the later growth of vegetation.
- The contractor shall apply soil conservation measures to the stockpiles to prevent erosion. This can include the use of erosion control fabric.
- Conduct a habitat assessment prior to construction to identify possible sensitive habitats and species that may be impacted by vegetation clearance.
- The works shall be cleared of alien vegetation as identified by the ESA. An effort must be made to remove the entire root system where after the plant shall be left to dry out on a hard surface that will not facilitate the germination of seed.
- Rivers and watercourses must be kept clear of felled trees, vegetation cuttings and debris.
- Where clearing for access purposes is essential, the maximum width to be cleared within the servitude must be in accordance with distance as agreed between the land owner and the EA holder.
- Alien invasive vegetation must be removed according to a plan (in line with relevant municipal and provincial procedures, guidelines and recommendations) allowed to desiccate on an impervious service or burned within a controlled area (such as a metal drum) before being disposed of at a recognised waste disposal facility
- Vegetation must be trimmed where it is likely to intrude on the minimum vegetation clearance distance (MVCD) or will intrude on this distance before the next scheduled clearance. MVCD is determined from SANS 10280.

- Debris resulting from clearing and pruning must be disposed of at a recognised waste disposal facility, unless the landowners wish to retain the cut vegetation.
- Trees felled due to construction must be documented and form part of the Environmental Audit Report.
- Equipment brought in for development activities must be thoroughly cleaned pre-arrival to avoid the accidental introduction of alien invasive species.
- All barren/unvegetated spaces cleared during construction, which also includes the creation of topsoil stockpiles should be kept clear of vegetation.
- Should any Species of Conservation Concern (SCCs) be located during construction activities, construction should be halted, and a qualified Botanist contacted to perform a search and rescue operation.
- Scarification of compacted soil should be performed during rehabilitation.
- All excess soil generated during foundation excavation must be disposed of in an appropriate manner and at a recognised disposal site, if not used for backfilling purposes.
- It is recommended that either a qualified botanist or knowledgeable ECO be contacted to rescue the individuals of the species *Raphionacme hirsute* on account of the characteristics of the plant which makes them of ecological interest (see Terrestrial Ecology Compliance Statement Report).

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8.4. Establishing office / camp sites:

- A method statement must be provided by the contractor prior to any onsite activity that includes the layout of the construction camp in the form of a plan showing the location of key infrastructure and services (where applicable), including but not limited to offices, overnight vehicle parking areas, stores, the workshop, stockpile and lay down areas, hazardous materials storage areas (including fuels), the batching plant (if one is located at the construction camp), designated access routes, equipment cleaning areas and the placement of staff accommodation, cooking and ablution facilities, waste and wastewater management.
- All construction activities should be restricted to the authorised areas and no disturbance shall occur outside of these areas.
- Vehicles and machinery will be maintained to such an extent as to not produce excessive noise and keep within the manufactures noise limitations.
- Normal working hours for construction will be kept to 07:00 – 17:00.
- In cases where facilities are linked to existing sewerage structures, all necessary regulatory requirements concerning construction and maintenance should be adhered to. The facilities must comply with the National Water Act requirements.
- Adequate signage must be provided, and the area must be appropriated secured.

- All formal documentation should be kept at the site office and be made available during monthly audits.
- Choice of site for the Contractor's camp requires the Project Manager's permission and must take into account location of local residents, water bodies and the anticipated final footprint of the development.
- The size of the construction camp should be kept to a minimal size.
- Adequate parking must be provided for site staff and visitors. This should not inconvenience or serve as a nuisance to neighbours.
- The Contractor must attend to drainage of the camp site to avoid standing water and / or sheet erosion.
- Suitable control measures over the Contractor's yard, plant and material storage to mitigate any visual impact of the construction activity must be implemented.
- The contractor is responsible for providing all sanitary arrangements for his and the sub-contractors team. A minimum of one chemical toilet must be provided per 15 persons.
- Sanitary arrangements must be to the satisfaction of the ECO. Toilets must be of the chemical type. The contractor must keep the toilets in a clean, neat and hygienic condition. Toilet paper dispensers must be provided in all toilets. It is the responsibility of the Contractor to ensure all toilets have been supplied with and have an available supply of toilet paper at all times.
- Toilets provided by the contractor must be easily accessible and a maximum of 50m from the works area to ensure they are utilised. All toilets will be located within the contractor's camp. Should toilets be needed elsewhere, their location must first be approved by the ECO.
- Where mobile chemical toilets are required, the following must be ensured:
    - Toilets are located no closer than 100 m to any watercourse or water body;
    - Toilets are secured to the ground to prevent them from toppling due to wind or any other cause;
    - No spillage occurs when the toilets are cleaned or emptied, and the contents are managed in accordance with the EMPr;
    - Toilets have an external closing mechanism and are closed and secured from the outside when not in use to prevent toilet paper from being blown out;
    - Toilets are emptied before long weekends and workers holidays, and must be locked after working hours;
    - Toilets are serviced regularly, and the ECO must inspect toilets to ensure compliance to health standards.
- The contractor must ensure that toilets are moved with the labour force.
- A copy of the waste disposal certificates must be maintained.

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8.5. Waste management

- The contractors must provide and maintain a method statement for "solid waste management". The method statement must provide information on the proposed licensed facility to be utilised and details must be kept of record keeping for auditing purposes.
- Waste must be separated into recyclable and non-recyclable waste, and must be separated as follows:
    - Hazardous waste: including (but not limited to) old oil, paints, sealants etc.,
    - General waste: including (but not limited to) construction rubble.
- Any illegal dumping of waste shouldn't be tolerated, this action will result in a fine and if required further legal action will be taken. This aspect must be closely monitored and reported on; proof of legal dumping must be able to be produced on request.
- Receptacle bins must be clearly marked for ease of management in terms of type of waste disposed of, e.g. paper, plastic, glass, etc.
- All refuse bins must have a lid secured so that animals or unauthorised individuals cannot gain access.
- Sufficient closed containers must be strategically located around the construction site to handle the amount of litter, wastes, rubbish, debris, and builder's waste generated on the site.
- Subcontractor(s) contracts must contain a clause to the effect that the disposal of all construction-generated refuse / waste to an officially approved dumping site is the responsibility of the subcontractor in question and that the subcontractors are bound to the management activities stipulated in this EMPr. Proof of this undertaking must be issued to the ECO.
- All solid and chemical waste that is generated must be removed and disposed of at a licensed waste disposal site. The contractor is to provide proof of such to the ECO.
- Chemical containers and packaging brought onto the site must be removed for disposal at a suitable site.
- A skip, with a cover, must be used to contain refuse from campsite bins, rubble and other construction material.
- Energy efficient equipment must be used as far as possible and not allowed to run for longer durations than is required by the activity.

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8.6. Air quality, noise and vibrations:

The main sources of impact on air quality are mobilization of equipment, land clearing and earthworks during the construction phase. During the operational phase, only routine maintenance will occur resulting in minimal disturbance associated with vehicle movements. To ensure air quality characteristics of the project area are maintained near the baseline conditions, the following measures shall be done:

- Only well-maintained vehicles and equipment should be operated on-site, and all machinery should be serviced regularly during the construction stage.
- Unnecessary simultaneous noisy activities should be avoided .
- No amplified music should be allowed at the site.
- 'Quiet' construction equipment should be selected wherever possible and working method and avoiding unnecessary revving and hooting.
- The Contractor must keep noise level within acceptable limits. The use of sound amplification equipment should be restricted for communication and emergencies only.
- Ear protection must be provided for activities that are likely to create noise in order to protect worker's health and safety.
- Any complaints received by the Contractor regarding noise must be recorded and communicated. Where possible or applicable, provide transport to and from the site on a daily basis for construction workers.
- A Code of Conduct must be developed for the construction phase in terms of behaviour of construction staff.
- In terms of noise impact for various increases over the ambient, the National Noise Regulations define an increase of 7dB as "disturbing". Noise levels during construction must therefore be kept within 7dB of the baseline data.
- All construction vehicles must be in a good working order to reduce possible noise pollution.
- Regular inspection and scheduled maintenance of all equipment must be held to ensure that construction vehicles are in good condition, are utilising fuel efficiently and do not smoke.
- Bare surfaces and excavations must be periodically watered during construction to keep the dust level down.
- Working schedules and work should be optimised to help to minimize several material vehicle mobilization trips.
- A vehicle speed limit of 30 km/h should be enforced for vehicles carrying construction material to reduce dust generation.
- Working hours for operation should be kept to 07:00 – 17:00.
- Material truck containers should be properly wrapped with a cover to avoid dust spreads on windy days and prohibiting transport of over loaded trucks.
- All forms of dust pollution must be managed in terms of the Atmospheric Pollution Prevention Act, 1965 (Act No. 45 of 1965).
- Safety equipment, such as dust-masks, should be provided for employees who work near the dusty location such as the heavy equipment operators.
- Where not defined, it must be ensured that development activities must still meet the impact management outcome related to noise management.
- Indigenous trees must be planted around the pump station during rehabilitation to minimise noise emanating from the pumpstation.

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implementing agent / contractor and Holder, the management outcomes will be achieved.)

8.7. Fire control

- The contractors must provide and maintain a **method statement** for "fires", clearly indicating where and for what, fires will be utilised plus details on the fuel to be utilised.
- Fires will only be allowed in facilities especially constructed for this purpose within fenced Contractor's camps. Wood, charcoal or anthracite are the only fuels permitted to be used for fires. The contractor must provide sufficient wood (fuel) for this purpose.
    - Fires within the designated areas must be small in scale so as to prevent excessive smoke being released into the air.
- The contractor must designate a smoking area for the labour force so as to prevent unanticipated incidents of veldt fires.
- Workers must be educated on the dangers of open and/or unattended fires.
- The local Fire Protection Agency (FPA) must be informed of construction activities.
- Contact numbers for the FPA and emergency services must be communicated in environmental awareness training and displayed at a central location on site.
- Contact details should be exchanged between the ECO and FPA.
- No wood is to be collected, chopped or felled for fires from private or public property as well as from no-go or sensitive areas within the site and any surrounding natural vegetation.

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8.8. Erosion control:

Construction activities will require the removal of vegetation cover, potentially resulting in soil erosion and subsequent impacts on surface water quality due to uncontrolled rainwater run-off or mechanical/wind action. The following measures are necessary to minimise impacts:

- Clearance of vegetation should be restricted to authorised development area.
- Appropriate drainage facilities must be constructed to make sure water runs smoothly downstream.
- Areas where construction has been finished should immediately be rehabilitated up to relevant standards, where possible.
- All structures of the stormwater management plan need to be inspected on a regular basis.
- Surface water or storm water must not be allowed to concentrate, or to flow down cut or fill sloped routes without erosion protection measures being in place.
- Geotextiles must be utilised to stabilise soils where necessary.

- Rehabilitation should include a thorough watering of mulched areas to ensure seed germination and vegetation growth before seasonal rains occur (within the confines of the revegetation strategy).
- To reduce the loss of material by erosion, the contractor must ensure that disturbance on site is kept to a minimum. The contractor is responsible for rehabilitating all eroded areas in such a way that the erosion potential is minimised after construction has been completed.

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8.9. Contamination of land:

Land contamination may occur as a result of fuel and oil leaks or spills and/or poor fuel, chemical and waste storage. The following measures are necessary to mitigate/ avoid the adverse effects of land contamination:

- The storage areas shall be securely fenced and appropriately marked to indicate the goods in the storage. Material Safety Data Sheets should be kept for all hazardous materials on site.
- All hazardous substances and stocks such as diesel, oils, detergents, etc., shall be stored in areas with impermeable flooring such as concrete and properly bunded.
- The storage areas for building materials, hydrocarbons or other chemicals must be situated as far away as practicably possible/feasible from any identified aquatic ecological features.
- Building material, hydrocarbon and other chemical storage areas must be adequately bunded in order to be able to contain a minimum of 150% of the capacity of storage tanks/units.
- No vehicles should be serviced on site. If they must be serviced on site then they should be serviced on an impermeable surface.
- Dedicated impervious areas should be designated for concrete mixing and the spillage from concrete mixed should be cleaned immediately.
- The waste management strategy on the construction site should be hinged on the waste hierarchy model of '*reduce, reuse and recycleô*waste in order to reduce the ultimate impact on the environment.
- Adequate hydrocarbon and other chemical storage, handling, usage and spillage clean-up procedures must be developed and all relevant employees must be sufficiently trained on- and apply these procedures during the construction phase.
- All spillage of oil onto concrete surfaces must be controlled by the use of an approved absorbent material and the used absorbent material disposed of at an appropriate waste disposal facility.
- Residues from machinery maintenance and other sources contaminated with hazardous waste should be stored in proper containers that avoid seepage to ground.

- Spills should be cleaned up immediately by removing the spillage together with the polluted soil and by disposing of them at a recognised facility.
- Adequate waste receptacles shall be made available, and all waste shall be adequately stored so that it does not pose a pollution risk.
- General waste is to be disposed of through the municipal service. Any other waste will be disposed of through only licensed waste disposal facilities.
- Volatile waste items such as plastic bags, cement bags, etc. should be temporarily stored in a suitable manner as to prevent it from being dispersed via wind.
- All waste management strategies employed by the contractor should comply with environmental / waste management legislation.
- The contractor should develop and comply to an on-site specific waste management plan.
- Construction labourers should be sensitised to dispose of waste in a responsible manner and not to litter. Labourers should be informed during toolbox talks.
- Chemical toilet facilities or other approved toilet facilities should be sited in such a way that they do not cause water or other pollution. The use of existing facilities must take place in consultation with the landowner/tenant.
- The contractor must provide **method statements** for the "handling & storage of oils and chemicals", "fire", and "emergency spills procedures".
- These substances must be confined to specific and secured areas within the contractor's camp, and in a way that does not pose a danger of pollution, even during times of high rainfall.
- The surface area of the drip trays will be dependent on the vehicle and must be large enough to catch any hydrocarbons that may leak from the vehicle while standing.
- The depth of the drip tray must be determined considering the total amount / volume of oil in the vehicle. The drip trays must be able to contain the volume of oil in the vehicle.
- Spill kits must be available on site and in all vehicles that transport hydrocarbons for dispensing to other vehicles on the construction site. Spill kits must be made up of material/product that is in line with environmental best practice.
- All spilt hazardous substances must be contained in impermeable containers for removal to a licensed hazardous waste site, this includes contaminated soils and drenched spill kit material.
- The contractors must provide and maintain a method statement for "cement and concrete batching". The method statement must provide information on proposed storage, washing & disposal of cement, packaging, tools and plants.
- Bagged cement must be stored in an appropriate facility and at least 10 m away from any water courses, gullies and drains.
- The mixing of concrete must only be done at specifically selected sites on mortar boards or similar structures to contain run-off into soils rocky outcrops, streams and natural vegetation.
- Cleaning of cement mixing and handling equipment must be done using proper cleaning trays. NOTE that water from cleaning cement from equipment constitutes does not constitute grey water and may not be utilised as such.
- Water from cleaning cement from equipment may be used for future mixing of cement.

- Any remaining water must be collected in a broad container and left only until the cement has settled out of the water. The water can then be decanted (without agitating the cement) and disposed of in the municipal wastewater system. The remaining cement can be disposed of at a licenced landfill as solid waste.
- All empty containers must be stored in a dedicated area and later removed from the site for appropriate disposal at a licensed facility.
- The visible remains either of concrete, solid, or from washings, must be physically removed immediately or disposed of as waste to a registered landfill site.
- Materials such as fuel and oil must be sealed and stored in bermed areas or under lock and key, as appropriate, in well-ventilated areas.
- Training on the handling of dangerous and toxic materials must be conducted for all staff prior to the commencement of construction.
- In the case of pollution of any surface or groundwater, the Regional Representative of the Department of Water and Sanitation (DWS) must be informed immediately.
- Storage areas must display the required safety signs depicting "no smoking", “No Naked lights" and "Danger". Containers must be clearly marked to indicate contents as well as safety requirements.
- Fuel storage tanks on the site must be on an impervious surface that is bunded and able to contain at least 110% of the volume of the tanks. The filler tap must be inside the bunded area where possible and the bund wall must not have a tap or valve.
- Fuel storage tanks must be placed so that they are out of the way of traffic, so that the risk of the tanks being ruptured or damaged by vehicles is minimised.
- Natural storm water runoff not contaminated during the development and clean water can be discharged directly to watercourses and water bodies, subject to the Project Manager’s approval and support by the ECO.

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8.10. Surface and ground water quality:

Poor chemical storage, poor waste management practices, poor material management processes may lead to the contamination of water sources. Sewage, sanitary effluent, contaminated wastewater runoff has the potential to adversely affect the quality of receiving water bodies unless properly managed. To eliminate the risk of contamination, the following measures have to be instituted:

- All the applicable requirements in terms of Sections 9 and 10 of GNR 40229: General Authorisation in terms of Section 39 of the National Water Act, 1998 (Act No. 36 of 1998) for Water Uses as Defined in Section 21(c) or Section 21(i), must be adequately implemented for both the construction- and subsequent operational phases of the proposed development.
- A Water Use License Application (WULA)/General Authorisation (GA) must be submitted to the Department of Water and Sanitation for the two (2) identified

significant ephemeral watercourse crossings as well as for the proposed development within the 100 m regulated area surrounding the single preferential water flow path/drainage line to the west, as required in accordance with the National Water Act (Act 36 of 1998).

- If hydrocarbons or other chemicals are to be stored on site during the construction phase, the storage areas must be situated as far away as practicably possible/feasible from the watercourse- and preferential water flow path/drainage line crossings.
- Any effluents containing oil, grease or other substances must be collected in a suitable receptacle and removed from the site for appropriate disposal at a recognised facility.
- All watercourses must be protected from direct or indirect spills of pollutants such as solid waste, sewage, cement, oils, fuels, chemicals, aggregate tailings, wash and contaminated water or organic material resulting from the Contractor's activities.
- Adequate hydrocarbon and other chemical storage, handling, usage and spillage clean-up procedures must be developed, and all relevant employees must be sufficiently trained on- and apply these procedures during the construction phase.
- Spill kits must be readily available at the construction site. All relevant employees must be adequately trained on the correct procedure and use of the spill kits.
- Implement an adequate stormwater and erosion management measures during the construction- and subsequent operational phases of the proposed development.
- In the event of a spill, prompt action must be taken to clear the polluted or affected areas.
- Implement suitable dust management and prevention measures during the construction phase of the proposed development.
- Construction areas and -roads to be sufficiently wetted down during the construction phase of the proposed development, in order to prevent significant fugitive dust emissions specifically at the proposed third-order watercourse crossings.
- In the event of pollution caused as a result of construction activities, the contractor, according to Section 20 of the National Water Act, 1998 (Act No. 36 of 1998) is responsible for all costs incurred by organisations called to assist in pollution control and/or to clean up polluted areas.
- Potable water must, wherever possible, not be used as a means of dust suppression, and alternative measures must be sourced. The use of 'grey' water must be investigated as an alternative. The contractor will be responsible to source this water and obtain the required approvals to utilise this water for the purpose of dust suppression.
- The proposed linear development footprint area at the ephemeral watercourses must be kept as narrow as practicably possible to reduce the surface impact on surrounding vegetation and no unnecessary/unauthorised footprint expansion into the surrounding undeveloped landscape may take place.
- No site construction basecamps may be established within the surrounding undeveloped landscape.
- Disturbed areas within and immediately surrounding the proposed development construction footprint area particularly the sections associated with the ephemeral watercourses- crossings must be adequately rehabilitated concurrently with the construction processes.

- When working in or near any watercourse the following environmental controls and consideration must be taken;
    - Water levels during the period of construction;
    - No altering of the bed, banks, course or characteristics of a watercourse;
    - During the execution of the works, appropriate measures to prevent pollution and contamination of the riparian environment must be implemented e.g. including ensuring that construction equipment is well maintained;
    - Where earthwork is being undertaken in close proximity to any watercourse, slopes must be stabilised using suitable materials, i.e. sandbags or geotextile fabric, to prevent sand and rock from entering the channel; and
    - Appropriate rehabilitation and re vegetation measures for the watercourse banks must be implemented timeously. In this regard, the banks should be appropriately and incrementally stabilised as soon as development allows.
- The necessary authorisations must be acquired from Department of Water and Sanitation (DWS) before construction may proceed.
- Adequate sewage spillage clean-up procedures must be developed and all relevant employees must be sufficiently trained on- and apply these procedures during the operational phase.
- Adequate leakage detection and prevention systems must be installed for the sewage pipeline in order to detect any potential leakages and subsequent contamination of the significant ephemeral watercourses and -preferential water flow path/drainage line as well as soil and groundwater resources.
- If any leakages or ruptures of the sewage pipeline occur, the competent authority must immediately be notified and the necessary steps must be followed by the applicant to locate and remediate the source of contamination, as soon as practicably possible/feasible.
- The integrity of the established pipeline must be inspected on a regular basis and adequately maintained over time, in order to ensure its continued functionality and prevent any leakages or ruptures.
- Adequate stormwater and erosion management measures must be implemented during the construction- and subsequent operational phases of the proposed development. This must be done to sufficiently manage storm water runoff and clean/dirty water separation, in order to prevent any significant soil erosion from occurring within and around the proposed development area and to attempt to maintain the ecological functionality and -integrity of the local and broader quaternary surface water catchment- and drainage area.
- It is recommended that the development design layouts for the proposed pumping station infrastructure, must include adequate stormwater management measures to ensure that sufficient volumes and quality of surface water runoff from the proposed development area during seasonal rainfall events, continue to be channelled through the local catchment/watershed towards the south and south-west.
- It is recommended that the construction of the proposed two identified significant ephemeral watercourse crossings be conducted during the winter season as far as practicably possible/feasible. The flow of the watercourses will be significantly reduced during this time, which should ease the excavation activities and result in reduced impeding of- and impact on flow.

- The lower flow during the winter season must however still be adequately diverted/channelled around the construction areas of the proposed two (2) identified significant ephemeral watercourse crossings, in order to ensure continued flow through the area during the construction period. Under no circumstances may the flow of the features be significantly impeded/blocked for any period of time, during construction. This must be done to maintain the local ecological connectivity, -functionality and subsequent -integrity of the semi-aquatic habitats.
    - If winter construction is however not practicably possible/feasible, the construction of the proposed two (2) identified significant ephemeral watercourse crossings must be completed within a maximum 5-day period of which the weather forecast predicts no possibility of rainfall.
- Water flow-breaks and dispersal infrastructure should be installed at the water release-points of the of the design layouts. This infrastructure must be able to adequately reduce the water flow velocity and disperse the water over a larger surface area, prior to entering into the surrounding landscape. This is necessary to prevent any potential localised erosion, which could occur at the water release-points due to high water volume concentration and flow velocity build-up. The water flow-breaks and dispersal infrastructure are to be adequately maintained and regularly cleaned out, as and when necessary.

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8.11. Water usage:

- Any water that is used which does not emanate from Municipality supplies must be registered and authorised by the Department of Water Affairs prior to usage commencement.
- Ensure water conservation is being practiced by:
    - Minimising water use during cleaning of equipment;
    - Undertaking regular audits of water systems; and
    - Including a discussion on water usage and conservation during environmental awareness training.
    - The use of grey water where appropriate is encouraged.
- The contractor shall promote responsible water use by all personnel.
- The wash water (grey water) collected from the cleaning of equipment on-site should not be left standing for long periods of time (in excess of a day) as this promotes parasite and bacterial proliferation.
- Excessive dust conditions must be reported to the ECO.
- Grey water should be recycled:
    - Used for dust suppression;
    - Used (reused) to clean equipment.
- Grey water that is not recycled should be removed on a regular basis.

- Washing of personnel or any equipment should not be allowed on site. Should it be necessary to wash construction equipment these should be done at an area properly suited and prepared to receive and contain polluted waters.

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8.12. Fauna and flora:

Fauna and flora are negatively impacted by the clearance of vegetation, noise from construction activities (disturbance) and gathering/ hunting of flora and fauna by workers. The following measures are necessary to mitigate impacts.

- Clearance of vegetation should be restricted to the absolute minimum required to facilitate access and undertaken construction activities.
- No interference with livestock must occur without the landowner's written consent and with the landowner or a person representing the landowner being present;
- Breeding sites must be kept intact and disturbance to breeding birds must be avoided.
- Special care must be taken where nestlings or fledglings are present;
- No poaching must be tolerated under any circumstances. All animal dens in close proximity to the works areas must be marked as Access restricted areas.
- No deliberate or intentional killing of fauna is allowed.
- Hunting/gathering/trapping of wild fauna by construction workers must not be permitted.
- Localized habitat features such as nests, dens or burrow sites should be avoided as much as possible. In addition, care should be taken in working in areas of active nesting, spawning, and feeding areas.
- All activities on site must comply with the regulations of the Animal Protection Act, 1962 (Act No. 71 of 1962).
- All construction workers must be informed that the intentional killing of any animal is not permitted as faunal species are a benefit to society. Poaching is illegal and it must be a condition of employment that any employee caught poaching will be dismissed.
- Employees must be trained on how to deal with fauna species as intentional killing will not be tolerated. In the case of a problem animal e.g. a large snake, a specialist must be called in to safely relocate the animal if the ECO is not able to.
- Environmental induction training and awareness must include aspects dealing in safety with wild animals into and on site. Focus on animals such as snakes and other reptiles that often generate fear by training workers how to move safely away and to whom to report the sighting. Workers should also be informed where snakes most often hide so that they can be vigilant when lifting stones, etc.
- Development in No-Go areas as described below must be avoided as far as is possible (Avoidance mitigation).

- During development, care should be taken to not unnecessarily clear or destroy indigenous vegetation.
- An alien invasive management plan is a recommended requirement for monitoring the invasion of alien and invasive species found in areas affected by disturbance.
- Alien and invasive species monitoring and eradication must take place quarter yearly for the duration of the development.

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8.13. Historical archaeological and heritage impacts:

- In the unlikely incident of anomalous / irregular shapes or forms on the landscape or in rocks (Figure 1) being potentially indicative of potential fossil remains or fossil-bearing landforms in the field, are found then, all excavations should stop immediately.
- Under no circumstances must archaeological artefacts be removed, destroyed or interfered with.
- The on-site environmental representative should consult the appointed ECO regarding any such discoveries.
- In terms of the National Heritage Act, 1999 (Act No. 25 of 1999), SAHRA and a qualified archaeologist be consulted within 48 hours.
- All construction debris/ waste should be removed from site and may not be deposited in on-site excavated waste pits.
- No loose chance finds such as stone age artefacts (arrow heads, stone flake blades etc.) may be collected.
- No unauthorised excavations post construction may be allowed.
- The HSO should be aware of the chance find protocol compiled by the heritage specialist which must be followed in the incidence of chance finds.

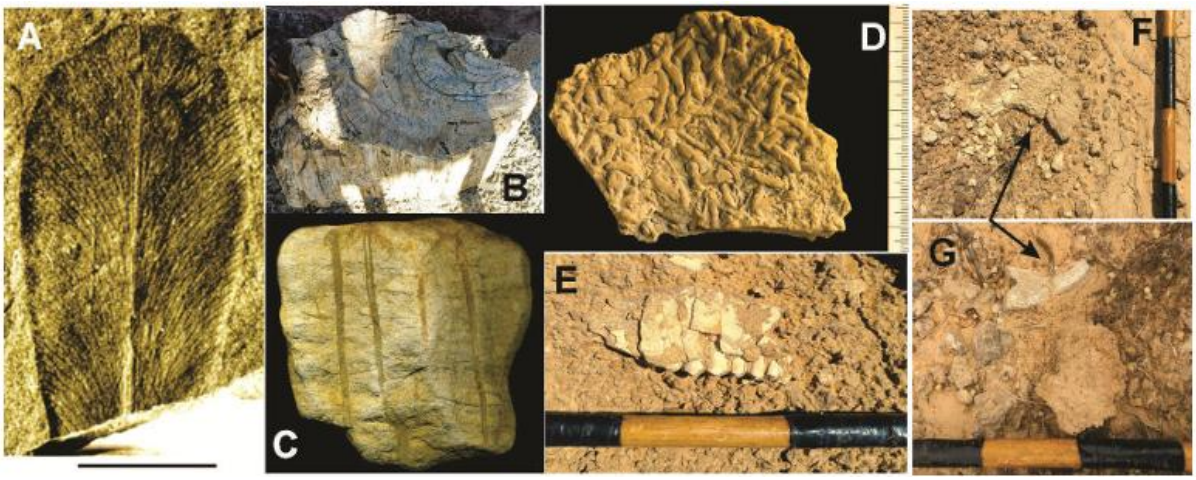

Figure 1: Easily recognizable features likely indicative of fossil remains within Ecca Group rocks include plant remains and petrified wood (A, B) and trace fossils (C, D). Vertebrate fossil remains to look out for in unconsolidated over bank deposits may include long bones, horn cores or teeth

fragments resembling odd looking and generally light-coloured stone-like objects (E, F & G). (from Heritage phase 1 Heritage Impact Assessment).

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8.14. Access roads

- Access to the servitude and tower positions must be negotiated with the relevant landowner and must fall within the assessed and authorised.
- An access agreement must be formalised and signed by the developer project manager (DPM), Contractor and landowner before commencing with the activities.
- All private roads used for access to the servitude must be maintained and upon completion of the works, be left in at least the original condition.
- All contractors must be made aware of all these access routes.
- Any access route deviation from that in the written agreement must be closed and re-vegetated immediately, at the contractor's expense.
- Maximum use of both existing servitudes and existing roads must be made to minimize further disturbance through the development of new roads.
- In circumstances where private roads must be used, the condition of the said roads must be recorded with photographic records: prior to use and the condition thereof agreed by the landowner, the DPM, and the contractor.
- Existing roads and farm tracks in close proximity to the proposed development construction footprint area, must be used during the construction phase. No new temporary roads or tracks may be constructed or implemented through the surrounding undeveloped landscape.

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8.15. Rehabilitation:

- Disturbed areas within and immediately surrounding the proposed development construction footprint area particularly portions in close proximity to any identified aquatic ecological features and the two identified significant ephemeral watercourse crossings must be adequately rehabilitated concurrently with the construction processes.
- A Rehabilitation Management Plan must be compiled by a suitably qualified and experienced ecologist.
- On completion of operations, all temporary buildings, structures or objects on the camp/office site shall be demolished and removed.
- On completion of operations, the areas shall be cleared of any contaminated soil, which must be dumped as per the waste management plan.

- All infrastructure, equipment, plant, temporary housing and roads and other items used during the construction period must be removed from the site and rehabilitated if necessary.
- Waste material of any description, including receptacles, scrap, rubble and tyres, must be removed entirely from the area and disposed of at a registered waste disposal facility. It will not be permitted to be buried or burned on the site.
- Disturbed areas should be left in a safe and stable manner. Preventative measures may be necessary to construct adequate drainage structures including ditches and other structures to facilitate the movement of surface water.
- Photographs of the camp and office sites, before and during the construction and after rehabilitation, shall be taken at selected fixed points and kept on record.
- Indigenous trees should be planted surrounding the pumpstation to minimise both the visual impact as well as to buffer any noise and vibrations emanating from the pump station.

Revegetation strategy:

- Cleared indigenous vegetation should be mulched for use in rehabilitation.
- **Topsoil** separated out during trenching must be seeded and backfilled **on top of** the backfilled **underlying soil**. The seeded topsoil must be mulched with the cleared vegetation.
- The seeded topsoil must be regularly watered in the months of September and October and watered at least initially after backfilling in the months November to April. It should not be watered in the months of April to August (Figure 1).
- Seeds sourced for revegetation must be indigenous and cleared by the ECO.
- Trees to be used for placed around the pump station (see Section 8.6) must be approved by an ECO.

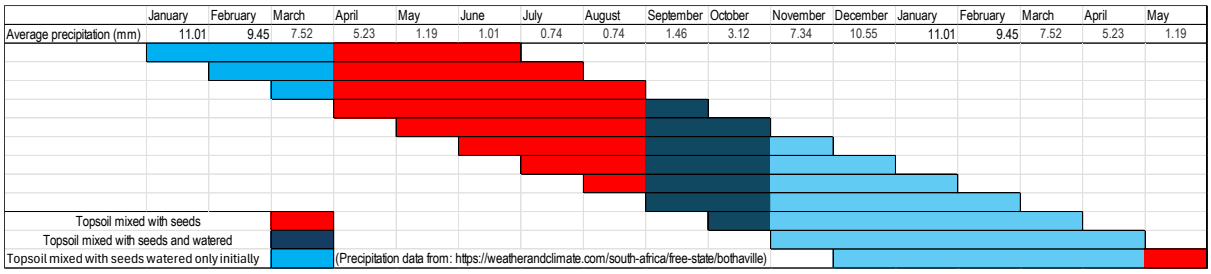

Figure 1: Outline of when to water topsoil mixed with seeds.

- It is recommended that a sufficient grazing management plan and practices must be implemented for livestock of the local communities, in order to prevent continued significant overgrazing of the proposed development area and surrounding landscape and to attempt to improve/restore the ecological condition, over time.

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8.16. Handling of emergencies:

- The contractor should identify all situations that can lead to emergency situations and provide response strategies. The situations should include fire, first aid and major chemical spill.
- An Emergency Response Action Plan (ERAP) must be compiled prior to the commencement of the proposed project.
- The Emergency Plan must deal with accidents, potential spillages and fires in line with relevant legislation.
- All staff must be made aware of emergency procedures as part of environmental awareness training.
- The relevant local authority must be made aware of a fire as soon as it starts.
- In the event of emergency necessary mitigation measures to contain the spill or leak must be implemented.
- Contact details of all departments/ service providers to be contacted in case of an emergency shall be made available to employees.
- Equipment for dealing with emergencies such as spill kits, firefighting equipment, first aid boxes etc. shall be made available and personnel properly trained in its use.
- Establish procedures for dealing with emergencies related to fence damage, breaches, or other safety incidents.
- All emergencies/ incidents should be reported and distributed to the relevant parties.

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8.17. Access restricted areas

- Identification of access restricted areas is to be informed by the environmental assessment, site walk through, and any additional areas identified during development.
- A temporary barrier with clear signage around the perimeter of any access restricted area should be erected, demarcated and maintained. Colour coding could be used if appropriate.
- Unauthorised access and development related activity inside access restricted areas is prohibited.

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9. METHOD STATEMENTS:

The Contractor shall submit written **Method Statements** to for all environmentally sensitive aspects of the work. It should be noted that Method Statements must contain sufficient information and detail to mitigate the potential impacts of the works on the environment. The Contractor will also need to thoroughly understand what is required of him / her in order to undertake the works. Work shall not commence until Method Statements have been put in place.

Appendix G.1: EAP Details

Lead EAP name	Mr. CW Vermeulen
Contact Information	+27 51 2 6350 cwv@envmgp.com
Company	Environmental Mana
Role(s)	Director, Avifauna Environmental Asse
Qualifications	BSc Environmental Biological Sciences BSc Hons
Professional registrations	EAPASA 2019/1521

Appendix G.2: EAP Curriculum Vitae

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CURRICULUM VITAE

C.W. Vermeulen

Director, Avifauna Specialist and Senior Environmental Assessment Practitioner

Personal Information

ID:	9001015150088
Nationality:	South African
Gender:	Male
EAPASA no:	2019/1521
Health:	Excellent
Vehicle License:	Code B
Language:	English/Afrikaans
Contact number:	082 824 9308
Email:	cwv@envmgp.com

Skills and Responsibilities

- Project Management
- Finance Management
- Review of EIA's, BAR's, Mining Permits and Mining Rights.
- Conduct Specialist Avifauna and Ecological Assessments.
- Use of Geographical Information Systems;
- Conduct Environmental Impact Assessments and other Environmental Technical Investigations;
- Apply and obtain, water licenses, mining permits and environmental authorisations for clients;
- Use different GIS datasets in order to create new information or investigate patterns for projects;
- Conduct environmental compliance and other environmental audits;
- Microsoft Office and Planet GIS.

Professional Experience

Employment History

Date	01/05/2017 - Present
Organisation	Environmental Management Group
Position	Director, Avifauna Specialist and Senior Environmental Assessment Practitioner
Duties and Responsibilities	Review all documentation associated with environmental Impact assessments, Financial Manager, Project Management, Conducting specialist Faunal and Avifaunal assessments. Applying for Water Use Licenses. Mining Rights and Permits, GIS Mapping. Environmental Impact Assessments, Environmental Compliance, Environmental Monitoring and Auditing. Composing and implementing Rehabilitation Plans.

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Date	01/08/2016 – 31/04/2017
Organisation	Terra Works
Position	Environmental Assessment Practitioner , Environmental Specialist (Fauna and Avifauna), Water Use License Application Consultant, General Environmental Consultant.
Duties and Responsibilities	Conducting specialist Faunal and Avifaunal assessments. Applying for Water Use Licenses. GIS Mapping.

Date	30/03/2016 – 01/08/2016
Organisation	Bokamoso Environmental
Position	Environmental Specialist (Fauna and Avifauna), Water Use License Application Consultant, General Environmental Consultant.
Duties and Responsibilities	Conducting specialist Faunal and Avifaunal assessments. Applying for Water Use Licenses. GIS Mapping.

Date	01/04/2015 – 28/03/2016
Organisation	Hilland Environmental
Position	Junior Environmental Assessment Practitioner and Environmental Specialist (Avifauna)
Duties and Responsibilities	Junior Environmental assessment Practitioner, Conducting faunal and floral Specialist Assessments, Environmental Impact Assessments, Environmental Compliance, Environmental Monitoring and Auditing. Composing and implementing Rehabilitation Plans.

Date	30/01/2015 – 30/03/2015
Organisation	Zantow Environmental
Position	Environmental Specialist Consultant (Alien and Invasive Flora)
Duties and Responsibilities	Conducting specialist assessments concerning alien and invasive flora.

Date	05/06/2009 – 15/12/2010
Organisation	Krugersdorp Game Reserve
Position	Assistant Game Manager
Duties and Responsibilities	Game capturing, Grazing capacity evaluations, Assisting with lion breeding project.

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Education

Institution	Degree(s) or Diploma(s) obtained
North West University, Potchefstroom 2010 – 2014	B.Sc. Environmental and Biological Sciences

Work Experience (Specialist Avifauna Assessments)

Date	Client	Project Name	Scope
April 2016	Bokamoso Environmental Consultants	Clubview Extension 92 (Mixed Use Development), Johannesburg, Gauteng	Scoping and EIA phase Avifauna Assessment
April 2016	Bokamoso Environmental Consultants	Fairview Interchange Development, Johannesburg, Gauteng	Scoping and EIA phase Avifauna Assessment
April 2016	Bokamoso Environmental Consultants	Knoppieslaagte Portion 331,109,105 Mixed Use Development, Pretoria, Gauteng	Scoping and EIA phase Avifauna Assessment
April 2016	Bokamoso Environmental Consultants	Knoppieslaagte Portion 73 Mixed Use Development, Pretoria, Gauteng	Scoping and EIA phase Avifauna Assessment
April 2016	Bokamoso Environmental Consultants	Waterval 38 IR Residential Development, Randburg, Gauteng	Scoping and EIA phase Avifauna Assessment
February 2016	Bokamoso Environmental Consultants	Lanseria Extension 66 Mixed Use Development, Pretoria, Gauteng	Scoping and EIA phase Avifauna Assessment
March 2016	Bokamoso Environmental Consultants	Lanseria Extension 51 Mixed Use Development, Pretoria, Gauteng	Scoping and EIA phase Avifauna Assessment
February 2016	Bokamoso Environmental Consultants	Lanseria Extension 65 Mixed Use Development, Pretoria, Gauteng	Scoping and EIA phase Avifauna Assessment
February 2016	Bokamoso Environmental Consultants	Lanseria Extension 65 Filling Station Development, Pretoria, Gauteng	Scoping and EIA phase Avifauna Assessment
March 2016	Bokamoso Environmental Consultants	Lanseria Extension 53 Township Development, Pretoria, Gauteng	Scoping and EIA phase Avifauna Assessment
March 2016	Bokamoso Environmental Consultants	Leeuwpoort 113 IR Residential Development, Boksburg, Gauteng	Scoping and EIA phase Avifauna Assessment
March 2016	Bokamoso Environmental	Leeuwpoort 113 IR	Scoping and EIA phase

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	Consultants	Mixed Use Development, Boksburg, Gauteng	Avifauna Assessment
April 2016	Bokamoso Environmental Consultants	Waterval 5-IR Commercial Township Development, Midrand, Gauteng	Scoping and EIA phase Avifauna Assessment
March 2016	Bokamoso Environmental Consultants	Watervall 5-IR Mixed Use Development, Midrand, Gauteng	Scoping and EIA phase Avifauna Assessment
April 2016	Bokamoso Environmental Consultants	Portion 23,162,196 of Nooitgedacht 534 JQ Mixed Use Development, Muldersdrift Gauteng	Scoping and EIA phase Avifauna Assessment
April 2016	Bokamoso Environmental Consultants	Portion 237 of Daspoort 319-JR, Residential Development, Gauteng	Scoping and EIA phase Avifauna Assessment
April 2016	Bokamoso Environmental Consultants	PWV 17 – Development of a 25 km National Road, Pretoria, Gauteng	Scoping and EIA phase Avifauna Assessment
April 2016	Bokamoso Environmental Consultants	Portion 7 of Steelpoortdrift 365 KT Commercial Township Development, Midrand, Gauteng	Scoping and EIA phase Avifauna Assessment
April 2016	Bokamoso Environmental Consultants	Portion 7 of Mooiplaats 355-JR, Mixed Use Development, Sunderland Ridge, Gauteng	Scoping and EIA phase Avifauna Assessment
April 2016	Bokamoso Environmental Consultants	Portion 3 of Onbekend 398-JR, Shooting Range Development, Bapsfontein, Gauteng	Scoping and EIA phase Avifauna Assessment
April 2016	Bokamoso Environmental Consultants	Winterveld Agricultural Holdings Extension 1 & 5, Upgrading and Redevelopment of Winterveld extension 1 & 5, Brits, Gauteng	Scoping and EIA phase Avifauna Assessment
September 2017	Eco-con Environmental	Zulanie 167 – Agricultural Development, Douglas, Northern Cape	Scoping and EIA phase Avifauna Assessment & In-depth White-backed Vulture Impact Assessment
September 2017	Eco-con Environmental	Lorraine 100 - Agricultural Development, Douglas, Northern Cape	Scoping and EIA phase Avifauna Assessment & In-depth White-backed Vulture Impact

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			Assessment
September 2017	Eco-con Environmental	Banks Drift 164 & Portion 1 of Christian's Drift 166, Douglas, Northern Cape	Scoping and EIA phase Avifauna Assessment & In-depth White-backed Vulture Impact Assessment

Environmental Impact Assessment Projects

Type	Client	Project	Role
Waste	**Metsimaholo Local Municipality**	Scoping/EIA; WULA application for the development of a new landfill site in Sasolburg	Co-author and Review of reports
	Joe Morolong Local Municipality	Scoping/EIA application for the development of a new landfill site in Hotazel	Co-author and Review of reports
Mining Permits or Rights	**Danoher Contracting (PTY) Ltd**	Mining Right application for a gravel BP in Bloemfontein	Co-author and Review of reports
	Michael Gutter	Mining Permit in Theunissen, Free State Province	Co-author and Review of reports
	Department of Rural Development and Land Reform	Mining Permit application for a sandstone Quarry in Zastron	Co-author and Review of reports
Road Construction	**Free State Department of Police, Roads and Transport**	BAR/IWUL/Mining Permit applications/ECO for the Deneysville - Jim Fouché road rehabilitation	Co-author and Review of reports
	Free State Department of Police, Roads and Transport	BAR/IWUL/Mining Permit applications/ECO for the Deneysville - Heilbron road upgrading	Co-author and Review of reports
	Free State Department of Police, Roads and Transport	BAR/IWUL applications/ECO for the Schonkenville - Koppies road upgrading	Co-author and Review of reports
	SANRAL	BAR/IWUL/ECO applications for the N1 Section 16 road upgrade	Co-author and Review of reports
	SANRAL	ECO Periodic Maintenance on National Route N6 Sec 8 from Reddersburg (km 0.00) to Rustfontein (km37.8)	Co-author and Review of reports

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	Department of Roads and Public Works, Northern Cape	BAR/IWUL/Mining Permit applications for the MR 938 Mamatwan road upgrade	Co-author and Review of reports
	Free State Department of Police, Roads and Transport	ECO for the internal road upgrades in Thumahole, Free State Province.	Co-author and Review of reports
	Department of Roads and Public Works, Northern Cape	Environmental Screening/BAR/IWUL/ DAFF Permit applications/ECO for the BK126 Magobing to Bathlaros road upgrade.	Co-author and Review of reports
	Department of Roads and Public Works, Northern Cape	Environmental Screening/BAR/IWUL/ DAFF Permit applications/ECO for the Tsineng to Washington road upgrade.	Co-author and Review of reports
	Department of Roads and Public Works, Northern Cape	BAR/IWUL/ DAFF Permit applications/ECO for the Hotazel to Maipeng road upgrade.	Co-author and Review of reports
Infrastructure Developments	**Amatola Water**	IWUL application/ECO for the installation of a bulk water pipeline, Herschel	Co-author and Review of reports
	Maluti A Phofung Local Municipality	IWUL application/ECO for the installation of a bulk water pipeline, Kestell to Qwa Qwa	Co-author and Review of reports
	Dr. Ruth Segomotsi Mompati District Municipality	BAR and IWUL applications for the upgrading of the Waste Water Treatment Works in Stella	Co-author and Review of reports
	Dr. Ruth Segomotsi Mompati District Municipality	Environmental Screening/EMP/IWULA/ECO for the construction of a water provision project for the village of Reivilo, Shaleng, Madipelesa, Karelstad, Mothlako, Molelema, Lykso, Pitsong and Kameelputs, North-West Province.	Co-author and Review of reports
	Dr. Ruth Segomotsi Mompati District Municipality	Environmental Screening/ EMP/IWULA/ECO for the construction of a water provision project for the village of Schweizer-reneke, Piet Plessis, Konke, Broedersput, Geduldspan, Louwna, Mabone and Maeng, North-West Province.	Co-author and Review of reports
	Department of Rural Development and Land Reform	Scoping EIA, WULA and Air Emission License for the development of a Brick factory in Thaba-Nchu	Co-author and Review of reports

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	Dr. Ruth Segomotsi Mompati District Municipality	Section 24G for the development of a pump station in the Wentzel Dam, Schweizer-reneke, North-West Province.	Co-author and Review of reports
	AURECON	ECO for the upgrading of 12 Bridges in the De Aar and Upington Areas,	Co-author and Review of reports
	EUROMID AFRICA Development	EIA/Scoping/IWULA and ECO for MATJHABENG PRECINCT IDP PROJECT 201621, Free State Province.	Co-author and Review of reports
	Umfundu Professional Services CC.	IWULA and EIA/Scoping for the Mmamahabane cemetery establishment, Free State	Co-author and Review of reports
	LMV (PTY) LTD.	Environmental Screening for the school developmentin Maokeng (Kroonstad) - Erwe 1500 & 24628, Free State Province	Co-author and Review of reports
	AURECON	Environmental Screening/BAR/WULA/ECO for Lindley Water Treatment Works and Pipeline route, Free State Province	Co-author and Review of reports
	Matjhabeng Local Municipality	Environmental Impact Assessment - Mmamahabane Cemetery Development, Ventersburg, Free State	Co-author and Review of reports
	Matjhabeng Local Municipality	Environmental Impact Assessment- Matjhabeng Precinct IDP Project 201621, Welkom Free State	Co-author and Review of reports
Residential Developments	**Greater Taung Local Municipality**	BAR application for Boipela Residential Development Extension in Reivilo	Co-author and Review of reports
Agriculture	**VS Kunsmis**	Scoping/EIA application for expansion of storage of a dangerous good at Vrede	Co-author and Review of reports
	Linheim	BAR/ECO for the expantion of the Linheim Sheep Feedlot, Free State Province	Co-author and Review of reports
	Wildeklawer	BAR application for the expansion of pivot systems near Barkley West	Co-author and Review of reports
	Department of Rural Development and Land Reform	Environmental Screening/BAR and WULA application for the development of an Agri-Park in Parys, Free State	Co-author and Review of reports
	Department of Rural Development and Land	Environmental Screening/S24G and WULA application for the development of an Agri-Park in Springfontein,	Co-author and Review of reports

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	Reform	Free State	
	Department of Rural Development and Land Reform	S24G and WULA application for the development of an Agri-Park in Thaba-Nchu, Free State	Co-author and Review of reports
	Department of Rural Development and Land Reform	Environmental Screening for the development of an Agri-Park in Tsiame, Free State	Co-author and Review of reports
	Department of Rural Development and Land Reform	Environmental Screening/BAR and WULA application for the development of an Agri-Park in Wesselsbron, Free State	Co-author and Review of reports
	Department of Rural Development and Land Reform	Environmental Screening/BAR and WULA application for the development of a Farmer Production Support Unit in Koffiefontein, Free State	Co-author and Review of reports
	Department of Rural Development and Land Reform	Environmental Screening/BAR and WULA application for the development of a Farmer Production Support Unit in Odendalsrus, Free State	Co-author and Review of reports
	Department of Rural Development and Land Reform	Environmental Screening for the development of a Farmer Production Support Unit in Sediba, Free State	Co-author and Review of reports
	Department of Rural Development and Land Reform	Environmental Screening/BAR application for the development of a Farmer Production Support Unit in Kroonstad, Free State	Co-author and Review of reports

Appendix G.3: EAP Certificate

Environmental Assessment Practitioners Association of South Africa

Registration No. 2019/1521

Herewith certifies that

CW VERMEULEN

is registered as an

Environmental Assessment Practitioner

Registered in accordance with the prescribed criteria of Regulation 15. (1) of the Section 24H Registration Authority Regulations (Regulation No. 849, Gazette No. 40154 of 22 July 2016, of the National Environmental Management Act (NEMA), Act No. 107 of 1998, as amended).

Effective: 01 March 2025

Expires: 31 March 2026

Chairperson

Registrar

SAQA
SOUTH AFRICAN QUALIFICATIONS AUTHORITY

EcoFocus
Ecological Specialist Services
Leave a future behind

Aquatic Biodiversity Theme Site Sensitivity Verification and Compliance Statement

Nala Local Municipality Pipeline and Pumping Station Development, Bothaville, Free State Province

January 2025

Compiled for:

EMG

Compiled by:

AJH Lamprecht (*Pr.Sci.Nat*)

Ecological Specialist

EcoFocus Consulting

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Assessment Protocol Requirements

Aquatic Biodiversity Compliance Statement

As per heading 3.2 of the Protocol, the compliance statement must **(click on links for quick access):**

- be applicable to the preferred site and the proposed development footprint **(see heading 4)**
- confirm that the site is of "low" sensitivity for aquatic biodiversity **(see heading 6.10)**
- indicate whether or not the proposed development will have an impact on the aquatic features **(see heading 10)**

As per heading 3.2 of the Protocol, this compliance statement contains, as a minimum, the following information **(click on links for quick access):**

- contact details of the specialist, their SACNASP registration number, their field of expertise and a curriculum vitae **(see heading 12)**
- a signed statement of independence by the specialist **(see page vii)**
- a statement on the duration, date and season of the site inspection and the relevance of the season to the outcome of the assessment **(see heading 2)**
- a baseline profile description of biodiversity and ecosystems of the site **(see headings 4, 6 & 7)**
- the methodology used to verify the sensitivities of the aquatic biodiversity features on the site including the equipment and modelling used where relevant **(see heading 3)**
- in the case of a linear activity, confirmation from the aquatic biodiversity specialist that, in their opinion, based on the mitigation and remedial measures proposed, the land can be returned to the current state within two years of completion of the construction phase **(see heading 10)**
- where required, proposed impact management outcomes or any monitoring requirements for inclusion in the EMPr **(see heading 8)**
- a description of the assumptions made as well as any uncertainties or gaps in knowledge or data **(see heading 5)**
- any conditions to which this statement is subjected **(see heading 10)**

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Abbreviations

BA	Basic Assessment
CARA	Conservation of Agricultural Resources Act (Act 43 of 1983)
CBA	Critical Biodiversity Area
DWS	Department of Water and Sanitation
EAP	Environmental Assessment Practitioner
EIA	Environmental Impact Assessment
EIS	Ecological Importance and Sensitivity
ESA	Ecological Support Area
MAP	Mean Annual Precipitation
NEMBA	National Environmental Management: Biodiversity Act (Act 10 of 2004)
NEMA	National Environmental Management Act (Act 107 of 1998)
NFA	National Forests Act (Act 84 of 1998)
NWA	National Water Act (Act 36 of 1998)
ONA	Other Natural Area
PES	Present Ecological State
REC	Recommended Ecological Category
SACNASP	South African Council for Natural Scientific Professions
SANBI	South African National Biodiversity Institute
SEI	Site Ecological Importance
WULA	Water Use License Application

Declaration of Independence

I, Adriaan Johannes Hendrikus Lamprecht, declare that I:

- am the Director and Ecological Specialist of EcoFocus Consulting (Pty) Ltd
- act as an independent specialist consultant in the field of botany and ecology
- am assigned as the Ecological Specialist consultant by the Environmental Assessment Practitioner (EAP), Environmental Management Group (Pty) Ltd, for the approved development
- do not have or will not have any financial interest in the undertaking of the proposed project activity other than remuneration for work as stipulated in the terms of reference/scope of work as per the quotation provided
- confirm that remuneration for my services relating to the approved development is not linked to approval or rejection of the project by the competent authority
- have no interest in secondary or subsequent developments as a result of the authorisation of the proposed project
- have no and will not engage in any conflicting interests in the undertaking of the activity
- undertake to disclose to the applicant and the competent authority any information that has or may have the potential to influence the decision of the competent authority
- will provide the applicant and competent authority with access to all relevant project information in my possession whether favourable or not

AJH Lamprecht

Signature

1. Introduction

The project applicant, Nala Local Municipality, proposes to formally construct a new linear section of sewage pipeline of approximately 990 m in length along with an associated pumping station of approximately 0.23 ha in size, to be situated approximately 950 m east of the town of Bothaville, Free State Province. The proposed sewage pipeline route will commence from the existing local Waste Water Treatment Works (WWTW) and continue in a westerly direction where it will tie into the proposed new pumping station.

Environmental Management Group (Pty) Ltd was appointed by the applicant as the independent Environmental Assessment Practitioner (EAP), to conduct the legally required Basic Assessment (BA) process.

A site sensitivity verification must be undertaken to determine and confirm the current land use and environmental sensitivity of the proposed development area as identified by the National Web-Based Environmental Screening Tool. Due to the nature of potential ecological impacts posed by the proposed development to the local ecosystem and ecology, an Aquatic Ecological study is required. This is required in order to determine the potential presence of ecologically sensitive/conservationally significant aquatic ecological features/habitats (watercourses and/or wetlands), plant- and/or faunal species, which may be adversely affected by the proposed development.

Potential aquatic ecological impacts posed by the proposed development to the local ecosystem and ecology, must be identified, evaluated, rated and discussed. Impact mitigation and management measures in accordance with the requirements of the National Environmental Management Act (Act 107 of 1998) Mitigation Hierarchy, must subsequently be recommended. This must be done in order to attempt to reduce/alleviate the adverse effects of identified potential aquatic ecological impacts associated with the proposed development.

EcoFocus Consulting was consequently appointed by the EAP as the independent ecological specialist, to conduct the required Aquatic Ecological study for the proposed development and to determine/confirm the environmental sensitivity of the proposed development area in accordance with the Aquatic Biodiversity Theme Protocol. This report constitutes the Aquatic Biodiversity Theme Site Sensitivity Verification and Compliance Statement.

Preliminary preparations conducted prior to the ecological site assessment, were as follows:

- Georeferenced spatial information was obtained of the proposed development area, in order to determine the direct impact footprint area.
- A desktop study was conducted of the most up-to-date information/data available on the relevant vegetation types, national/provincial biodiversity conservation status/significance and the potential/likely presence of watercourses/wetlands associated with the proposed development area.

2. Date of Aquatic Ecological Site Assessment

A site assessment of the proposed development area was conducted on 17 January 2025. This date forms part of the summer/growing season and most plant species could therefore be successfully identified.

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3. Methodology

- Significant watercourses and/or wetlands and/or other aquatic ecological features/habitats were identified, delineated and discussed as per the accepted methodology described below, if potentially found to be present within the assessment area.
    - For the purposes of this investigation a wetland was defined according to the definition in the National Water Act (Act 36 of 1998) as: "land which is transitional between terrestrial and aquatic systems, where the water table is usually at or near the surface, or the land is periodically covered with shallow water and which in normal circumstances, supports or would support vegetation typically adapted to life in saturated soil."
    - In 2005 DWAF published a wetland delineation procedure in a guideline document titled "A Practical Field Procedure for the Identification and Delineation of Wetlands and Riparian Areas". These guidelines contain a number of stipulations relating to the protection of wetlands and the undertaking of wetland assessments.
    - To delineate any wetland, the following criteria is used in accordance with the Department of Water Affairs (DWA): Updated manual for identification and delineation of wetlands and riparian areas, Edition 2 September 2008.
    - The wetland delineation procedure identifies the outer edge of the temporary zone of the wetland, which marks the boundary between the wetland and adjacent terrestrial areas. This constitutes the part of the wetland that might remain flooded or saturated close to the soil surface for only a few weeks in the year, but long enough to develop anaerobic conditions and determine the nature of the plants growing in the soil.
    - The guidelines also state that the locating of the outer edge of the temporary zone must make use of four specific indicators namely:
        - terrain unit indicator
        - soil form indicator
        - soil wetness indicator
        - vegetation indicator
    - In addition, the watercourse/wetland and a protective buffer zone beginning from the outer edge of the wetland temporary zone, was designated as sensitive in a sensitivity map. The guidelines stipulate buffers to be delineated around the boundary of a wetland. An adequate protective buffer zone, beginning from the outer edge of the wetland temporary zone, was implemented and designated as sensitive within which no development must be allowed to occur.

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- Visual observations/identifications were made of general aquatic botanical/vegetation habitats and their conditions as well as any aquatic ecologically sensitive/conservationally significant areas/habitats within the assessment area.
- Visual observations/identifications were made of general and conservationally significant aquatic plant species encountered within the assessment area.
    - Identified plant species were listed and categorised as per the Red Data Species List; Nationally Protected Tree Species List of the National Forests Act (Act 84 of 1998), Threatened or Protected Species (ToPS) List of the National Environmental Management: Biodiversity Act (Act 10 of 2004) (NEMBA TOPS, 2023), Provincially Protected species of the Free State's Nature Conservation Ordinance (No 8 of 1969) as well as the Invasive Species List of the National Environmental Management: Biodiversity Act (Act 10 of 2004), Alien and Invasive Species Regulations, 2014..
- A desktop assessment was conducted of conservationally significant aquatic faunal species (excluding avifauna) which can potentially be encountered within the assessment area.
    - The Virtual Museum and the IUCN Red List of Threatened Species were used for the desktop assessment.
    - The likelihood was discussed of identified aquatic faunal species utilising the aquatic botanical/vegetation habitats and significant aquatic ecological features/habitats within the assessment area as refuge or for breeding, foraging and/or persistence purposes.
    - Low-level invasive assessments were also conducted of potentially active significantly sized burrows encountered within the assessment area, with the use of an endoscope camera.
    - No actual on-site trapping, sampling or specifically focused assessments of any aquatic faunal species was conducted.
    - Aquatic faunal species encountered during the site visit were however noted and discussed.
- Georeferenced photographs were taken of any Red Data Species Listed-, nationally- or provincially protected aquatic plant species, aquatic ecologically sensitive/conservationally significant areas as well as significant watercourses and/or wetlands and/or other aquatic ecological features/habitats, if encountered within the assessment area. This was done in order to indicate their specific locations in a Geographic Information System (GIS) mapping format.

The **Present Ecological State (PES)** of all significant aquatic features/habitats identified within the assessment area, was determined and discussed as per the table below, by conducting a WET-Health Level 1b assessment for wetlands or the Index of Habitat Integrity assessment (IHI, 1999) for watercourses.

- The Present Ecological State (PES) refers to the current state or condition of an area in terms of all its characteristics and reflects the change to the area from its reference condition. The value gives an indication of the alterations that have occurred in the ecosystem.

Table 1: Criteria for PES calculations

PES Category	Score	Description
A	0 – 0.9 > 90 - 100%	**Unmodified**, natural and pristine.
B	1 – 1.9 > 80 - 90%	**Largely natural**. A small change in natural habitats and biota may have taken place but the ecosystem functionality has remained essentially unchanged.
C	2 – 3.9 > 60 - 80%	**Moderately modified**. Moderate loss and transformation of natural habitat and biota have occurred, but the basic ecosystem functionality has still remained predominantly unchanged.
D	4 – 5.9 > 40 - 60%	**Largely modified**. A significant loss of natural habitat, biota and subsequent basic ecosystem functionality has occurred.
E	6 – 7.9 > 20 - 40%	**Seriously modified**. The loss of natural habitat, biota and basic ecosystem functionality is extensive.
F	8 – 10 0 - 20%	**Critically/Extremely modified**. Transformation has reached a critical level and the ecosystem has been modified completely with a virtually complete loss of natural habitat and biota. The basic ecosystem functionality has virtually been destroyed and the transformation is irreversible.

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The **Ecological Importance and Sensitivity (EIS)** of all significant aquatic features/habitats identified within the assessment area, was determined and discussed as per the table below, by conducting a WET-EcoServices assessment for wetlands or rapid EIS for watercourses.

- The Ecological Importance and Sensitivity (EIS) of an area is an expression of its importance to the maintenance of ecological diversity and functioning on local and wider scales. Both abiotic and biotic components of the system are taken into consideration. Sensitivity refers to the system's ability to resist disturbance and its capability to recover from disturbance, once it has occurred.

Table 2: Criteria for EIS calculations

EIS Category	Score	Description
D	≤ 1.0	**Low/Marginal.** Not ecologically important and/or sensitive on any scale. Biodiversity is ubiquitous and not unique or sensitive to habitat modifications.
C	1.1 - 2	**Moderate.** Ecologically important and sensitive on local or possibly provincial scale. Biodiversity is still relatively ubiquitous and not usually sensitive to habitat modifications.
B	2.1 - 3	**High.** Ecologically important and sensitive on provincial or possibly national scale. Biodiversity is relatively unique and may be sensitive to habitat modifications.
A	3.1 - 4	**Very High.** Ecologically important and sensitive on national and possibly international scale. Biodiversity is very unique and sensitive to habitat modifications.

The **Recommended Ecological Category (REC)** of all significant aquatic features/habitats identified within the assessment area, was determined and discussed as per the table below.

- The Recommended Ecological Category (REC) of an area is an expression of the ecological category, within which it is recommended for a water resource to be managed. In the event of a high EIS value, the management objective should constitute improvement of the water resource condition. In the event of a medium or low EIS value, the management objective should constitute maintenance of the current water resource condition. The PES value however also bears relevance in determining a feasible REC value.

Table 3: Criteria for REC calculations

PES Category	EIS Category			
	Very High	High	Moderate	Low
A	A - Maintain	A - Maintain	A - Maintain	A - Maintain
B	A - Improve	A/B - Improve	B - Maintain	B - Maintain
C	B - Improve	B/C - Improve	C - Maintain	C - Maintain
D	C - Improve	C/A - Improve	D - Maintain	D - Maintain
E	D - Improve	D - Improve	D - Improve	D - Improve
F	D - Improve	D - Improve	D - Improve	D - Improve

Potential aquatic ecological impacts posed by the proposed development to the local ecosystem and ecology, were identified and evaluated. Impact mitigation and management measures in accordance with the requirements of the National Environmental Management Act (Act 107 of 1998) Mitigation Hierarchy, are subsequently recommended, in order to attempt to reduce/alleviate the adverse effects of identified potential aquatic ecological impacts associated with the proposed development.

4. Assessment Area

The assessment area constitutes the following footprint areas:

- Sewage pipeline route = approximately 990 m in length
  - The proposed pipeline will merely constitute a narrow linear clearance and excavation section of approximately ≤ 3 m in width. As the proposed pipeline will be placed underground, the surface disturbance and impact associated with the proposed development is merely temporary in nature.
- Pumping station = approximately 0.23 ha in size
- Surrounding approximate 100 m (watercourses) and 500 m (wetlands) aquatic regulated areas.

The proposed development areas are situated on the Remaining Extents of the Farms Kgotsong No. 1195 and Botharnia No. 9 (SG 21 Digit Codes: F00500000000119500000 & F00500000000000900000), approximately 950 m east of the town of Bothaville, Free State Province. The town forms part of the Nala Local Municipality which in turn, forms part of the lejweleputswa District Municipality. According to the information received from the EAP, the assessment area falls within the municipal urban edge. Access to the assessment area is obtained by way of the R727 provincial road.

See locality map below (see A3 sized map in the Appendices).

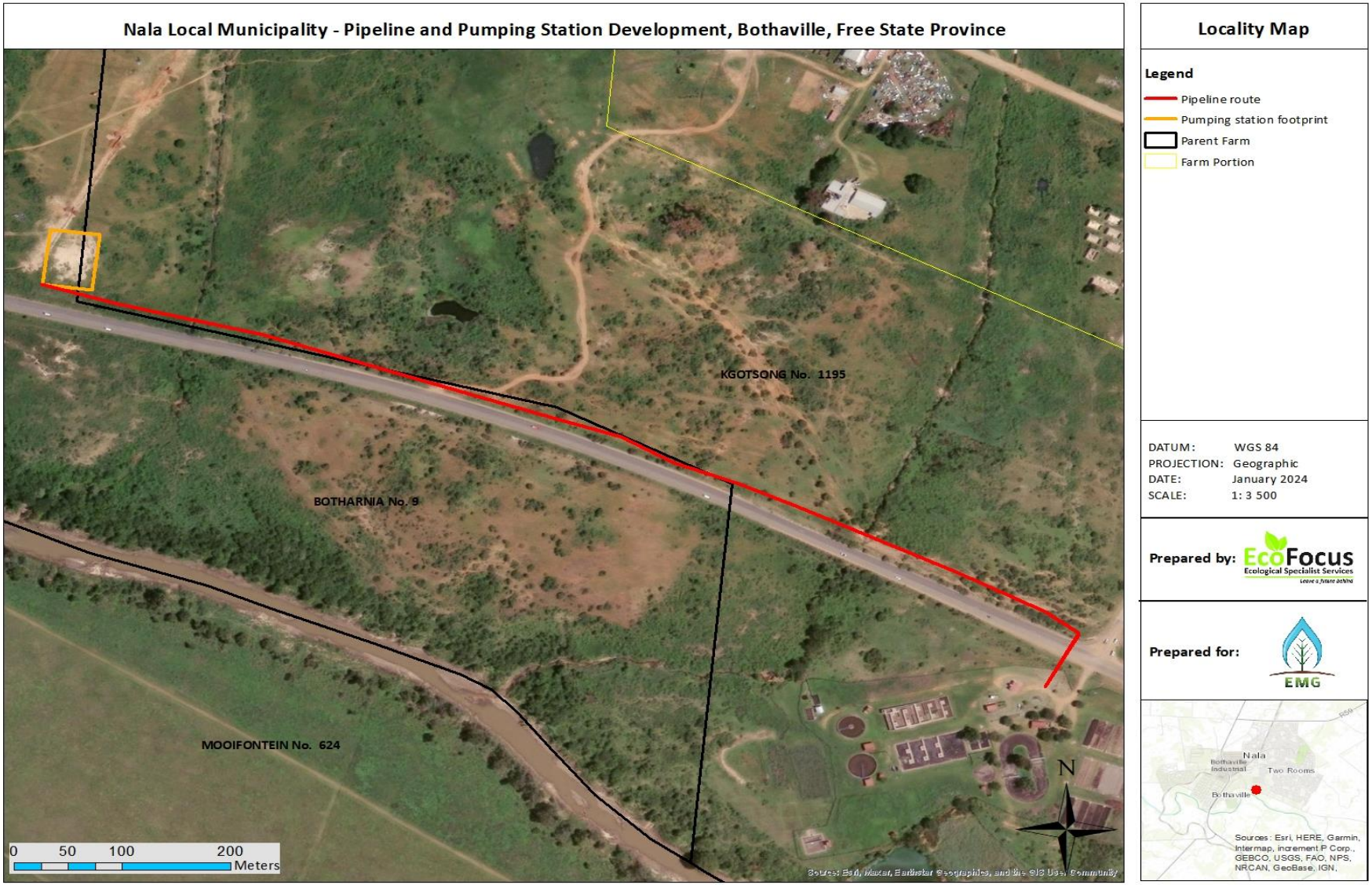

Figure 1: Locality map illustrating the assessment area

4.1. Climate

The rainfall of the region peaks during the summer months and the Mean Annual Precipitation (MAP) of the area is approximately 615 mm (www.climate-data.org). The maximum average monthly temperature is approximately 22.6°C in the summer months while the minimum average monthly temperature is approximately 9.7°C during the winter (www.climate-data.org). Maximum daily temperatures can reach up to 28.9°C in the summer months and dip to as low as 2.6°C during the winter (www.climate-data.org).

4.2. Geology and Soils

According to Mucina & Rutherford (2006) the geology of the landscape and associated vegetation types can be described as the following:

The assessment area is mainly covered by deep sandy to clayey alluvial soils developed over Quaternary alluvial sediments.

4.3. Vegetation Type and Provincial Biodiversity Status

Vegetation Type

According to SANBI (2006-2019), the entire assessment area falls within the Highveld Alluvial Vegetation vegetation type (Aza 5). This vegetation type mainly consists of a flat topography supporting riparian thickets accompanied by seasonally flooded grasslands. This vegetation type is classified as Least Concerned (SANBI, 2006-2019).

Aquatic Provincial Biodiversity Status

The Free State Province does not possess separate/specific spatial data for terrestrial and aquatic provincial biodiversity conservation statuses/categories. The relevant provincial information is rather combined into a single wholistic provincial biodiversity conservation status/category spatial data set, which sets out biodiversity priority areas in the province. This spatial data set is known as the Free State Provincial Spatial Biodiversity Plan (Collins, 2019).

The entire assessment area is categorised as Other Natural Area (ONA), according to the Free State Provincial Spatial Biodiversity Plan (Collins, 2019).

See vegetation type- and provincial biodiversity status maps below (see A3 sized maps in the Appendices).

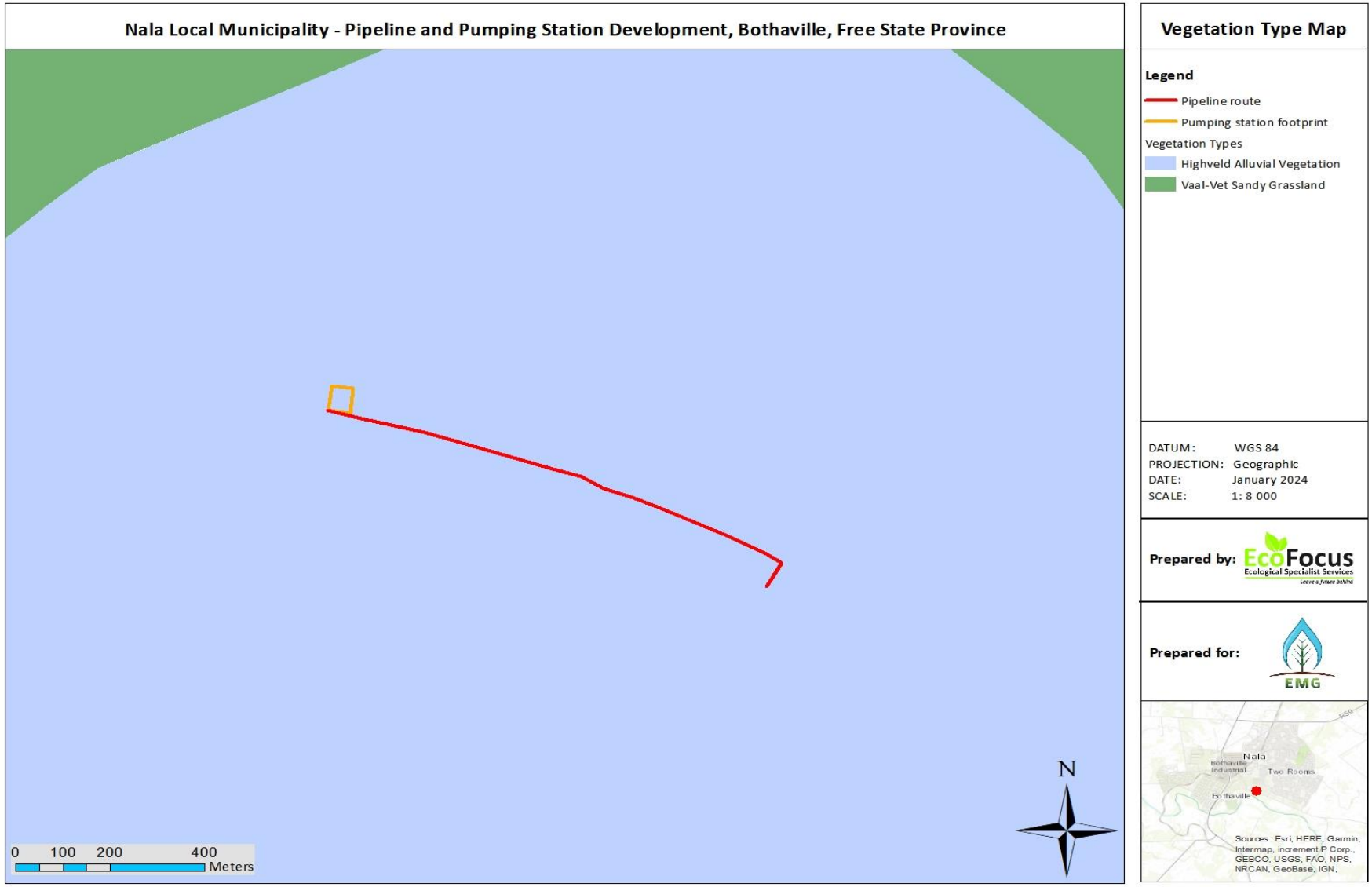

Figure 2: Vegetation type map illustrating the vegetation type associated with the assessment area

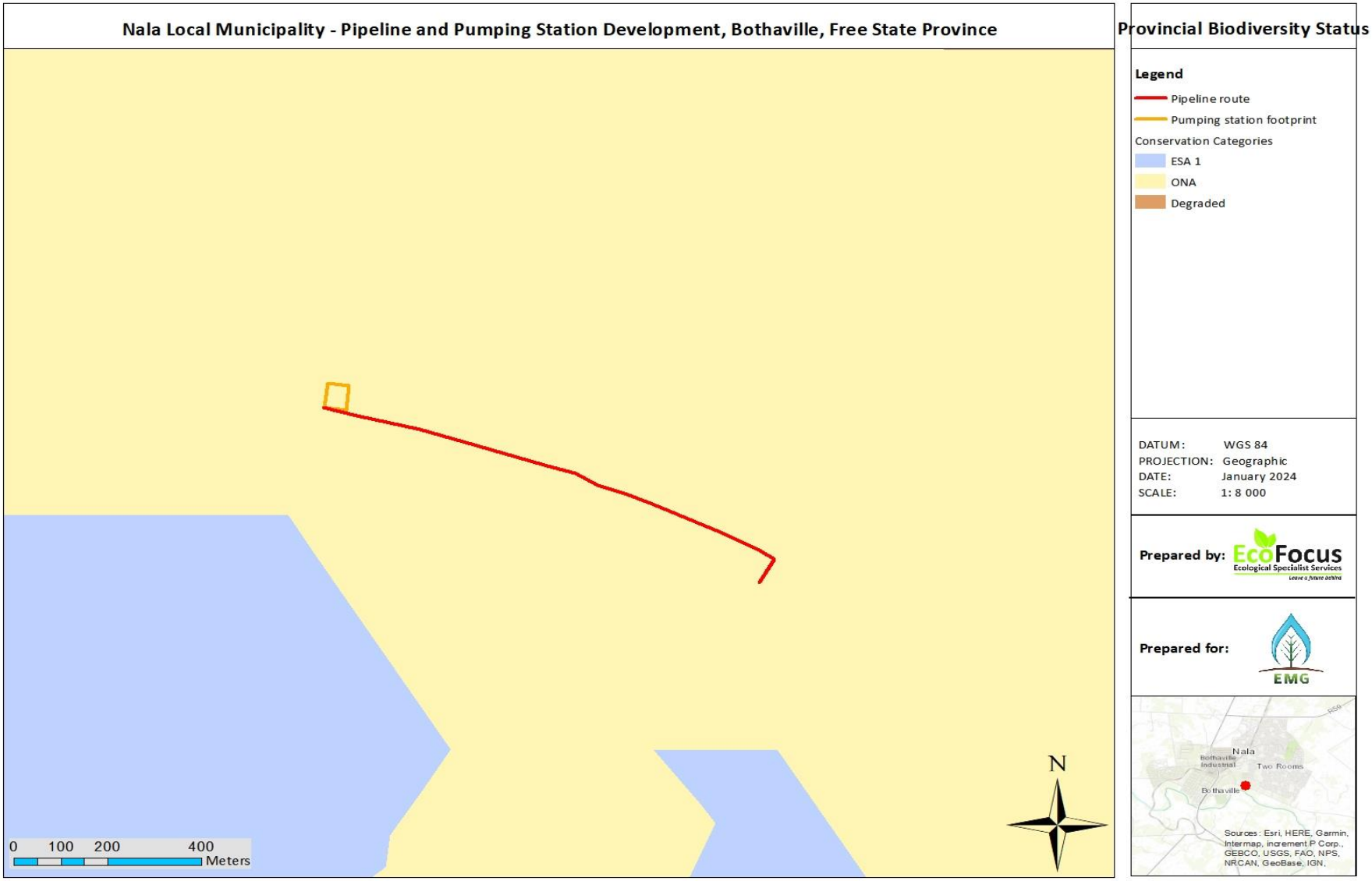

Figure 3: Provincial biodiversity status map illustrating the provincial biodiversity status/category associated with the assessment area

5. Assumptions, Uncertainties and Gaps in Knowledge

Various assumptions need to be made during the assessment process, at the hand of the relevant specialist. It is assumed that:

- all relevant project information provided to the ecological specialist by the EAP, was correct and valid at the time that it was provided.
- the proposed development area as provided by the EAP, is correct and will not be significantly deviated from, as this was the only area assessed.
- strategic level investigations undertaken by the applicant prior to the commencement of the Environmental Impact Assessment/Basic Assessment process, determined that the proposed development area represents a potentially suitable and technically acceptable location.
- the public, local communities, relevant organs of state and surrounding landowners will receive a sufficient reoccurring opportunity to participate and comment on the proposed development during the Environmental Impact Assessment/Basic Assessment process, through the provision of adequately facilitated public participation interventions and timeframes as stipulated in the NEMA: EIA Regulations, 2014.
- the need and desirability of the proposed development is based on strategic national, provincial and local plans and policies, which reflect the interests of both statutory and public viewpoints.
- the EIA/BA process is a project-level framework and the specialists are limited to assessing the anticipated environmental impacts, associated with the construction- and subsequent operational phases of the proposed development.
- it is assumed that strategic level decision making by the relevant authorities will be conducted through cooperative governance principles, with the consideration of environmentally sustainable and responsible development principles underpinning all decision making.

Given that an EIA/BA involves prediction, the uncertainty factor forms part of the assessment process. Two types of uncertainty are associated with the EIA/BA process, namely process-related and prediction-related.

- Uncertainty of prediction is critical at the data collection phase as observations, recommendations and conclusions are made, solely based on professional specialist opinion. Final certainty will only be obtained upon actual implementation of the proposed development. Adequate research, specialist experience and expertise should however minimise this uncertainty.
- Uncertainty of relevant decision making relates to the interpretation of provided information by relevant authorities during the EIA/BA process. Continual two-way communication and coordination between EAP's and relevant authorities should however decrease the uncertainty of subjective interpretation. The importance of widespread/comprehensive consultation towards minimising the risk/possibility of omitting significant information and impacts is further stressed. The use of quantitative impact significance rating formulas (as utilised in this document) can further standardise the objective interpretation of results and limit the occurrence and scale of uncertainty and subjectivity.
- The principle of human nature provides for uncertainties and unpredictability with regards to the socio-economic impacts of the proposed developments and the subsequent public reaction/opinion, which will be received during the Public Participation Process (PPP).

Gaps in knowledge can be attributed to:

- This report purely constitutes an Aquatic Ecological Assessment; no terrestrial ecological aspects were therefore assessed or taken into consideration during any discussions, conclusions and/or recommendations associated with this report
- The aquatic ecological assessment process was undertaken prior to the availing of certain information, which would only be derived from the final development design and layout. The design layout for the proposed development, had not been finalised yet at the time of the aquatic ecological assessment.
- Extensive existing residential, industrial and commercial transformation associated with the town and its township as well as historical and existing agricultural cropland cultivation transformation, is evident throughout the local and broader surrounding landscape, intertwined to a lesser extent, with portions of undeveloped reasonably natural habitat. This local surrounding landscape is furthermore also highly fragmented, from an ecological connectivity and -functionality perspective.
- The potential for future similar developments in the same geographical area, which could lead to further cumulative impacts, cannot be meaningfully anticipated. It is however likely that further similar sewage pipeline development and subsequent transformation could take place throughout the local area, over time.

EcoFocus Consulting is an independent ecological specialist company. All information and recommendations as per this report are therefore provided in a fair and unbiased/objective manner and are solely based on qualitative data gathered as well as professional specialist observation and opinion.

6. Site Sensitivity Verification

6.1. Proposed Development Area Clearance

The proposed development area constitutes the following footprint areas:

- Sewage pipeline route = approximately 990 m in length
  - The proposed pipeline will merely constitute a narrow linear clearance and excavation section of approximately ≤ 3 m in width. The mechanical clearance associated with the proposed development, will in all probability completely transform the majority of the existing surface vegetation within the narrow proposed linear development area. As the proposed pipelines will be placed underground, the surface disturbance and impact associated with the proposed development is merely temporary in nature.
- Pumping station = approximately 0.23 ha in size
  - The mechanical clearance associated with the proposed development, will in all probability completely transform the majority of the existing surface vegetation throughout the footprint area.

6.2. Environmental Screening Tool

According to the Environmental Screening Tool Report, the Aquatic Biodiversity Theme of the assessment area is rated as being of 'low sensitivity'.

Figure 4: Aquatic Biodiversity Theme Sensitivity as per the DFFE Screening Tool

6.3. Water Catchment and Drainage

The assessment area falls within the Middle Vaal Water Management Area (WMA 09) and the associated C60J quaternary surface water catchment- and drainage area. It is furthermore situated in the C60J - 2234 Sub Quaternary Reach (SQR), within the Highveld Ecoregion (11). The assessment area generally slopes slight to moderately towards the south and south-west, towards the Vals River which flows past the assessment area approximately 230 m south at its nearest point.

6.4. Watercourse Baseline Information

According to the available desktop water catchment and drainage data of the latest South African National Biodiversity Assessment of 2018 (Van Deventer et al., 2019), there are no significant natural perennial watercourses, wetlands or -salt pans of which the regulated areas fall within the assessment area.

Two significant ephemeral watercourses traverse the assessment area, while a single very small ephemeral preferential water flow path/drainage line furthermore flows past the assessment area within 100m.

According to the National Freshwater Ecosystem Priority Areas Database (NFEPA, 2011), the portion of the C60J - 2234 Sub Quaternary Reach (SQR) associated with the assessment area, does not fall within any Freshwater Ecosystem Priority Area (FEPA), Fish Support Area, -Sanctuary, -Corridor or -Rehabilitation Area. No populations of conservationally significant threatened fish species have been recorded throughout the assessment area or local downstream region or are expected to specifically utilise the assessment area as refuge or for breeding, foraging and/or persistence purposes. These factors all significantly reduce the aquatic conservational significance/value of the area.

See desktop water catchment and drainage data map below (see A3 sized map in the Appendices).

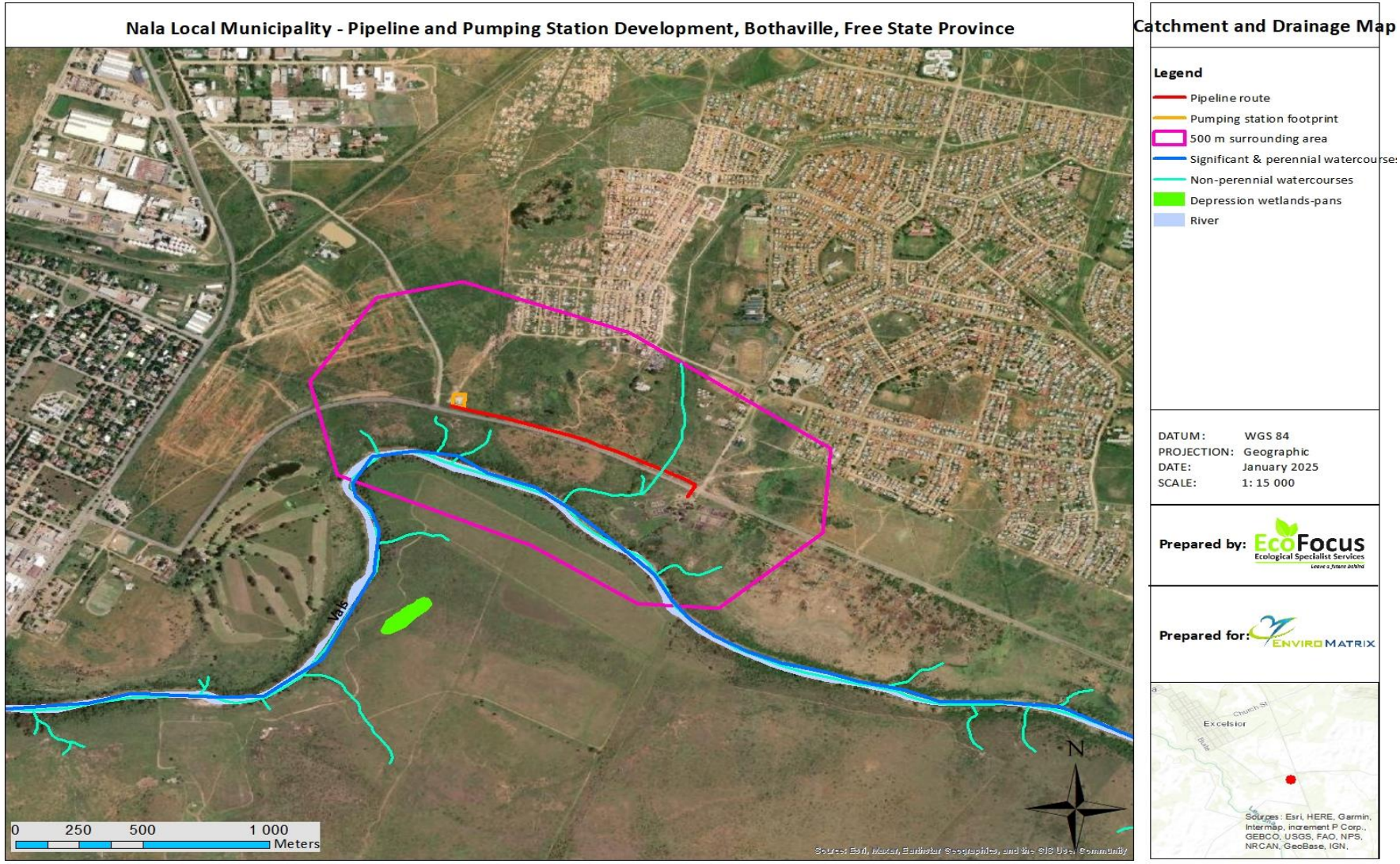

Figure 5: Desktop water catchment and drainage data map illustrating the main watercourses and wetlands/pans associated with the assessment area

The aquatic ecological features identified throughout the assessment area are divided into the following main categories for reporting purposes:

- Significant ephemeral watercourses
- Preferential water flow path/drainage line
- Artificially wet areas

6.5. Significant Ephemeral Watercourses

6.5.1. Aquatic Feature Description and Current Existing Vegetation

Two significant first-order ephemeral watercourses respectively traverse the eastern and western sections of the proposed pipeline route. They continue in a southerly and south-westerly direction and eventually discharge into the Vals River. The watercourses possess small upstream surface water catchment areas and consequently merely assist with channelling low to moderate volumes of temporary surface water runoff during seasonal rainfall events. It is therefore evident from a hydrological perspective, that the watercourses constitute moderate-importance components of the local and broader quaternary surface water catchment- and drainage area. It is consequently essential that the natural flow regimes of the watercourses are not significantly and/or permanently contaminated or impacted by the proposed development.

The easterly situated watercourse possesses a distinct narrow deeply-incised/eroded ephemerally active streamflow channel with a dominant sandy substrate. Anthropogenically established gabion walls and baskets are intermittently present within the channel, throughout the upstream section (north of the R727 provincial road). Due to the ephemerality and associated lack of continuous natural surface water flow through the local area, the watercourse possesses no distinct or ecologically important semi-aquatic/riparian habitat or any significant variation in vegetation species composition or -structure, relative to the surrounding terrestrial landscape. It however houses a moderately increased density representation of woody shrub species along its edges/banks, relative to the surrounding terrestrial landscape (100 m surrounding regulated area as no 1:100-year floodline delineation or riparian habitat is available).

The specific section of the watercourse to be traversed by the proposed pipeline route, constitutes extensive concentrated livestock footpaths and is therefore mostly in a moderate to highly disturbed and degraded pioneer ecological state. Substantial historical and continued long-term overgrazing by livestock from the local communities along with extensive cutting down of woody tree and shrub individuals for domestic proposes is evident. The assessment area is traversed by numerous footpaths that are used for daily commuting by the local community. Domestic waste/garbage dumping is also extensively evident throughout the watercourse. It is furthermore also reasonably assumed that the local area is likely anthropogenically burnt on a regular basis. Such continued anthropogenic activities tend to cause an ecological 'edge effect', which negatively impacts on the urban/rural development interface area and subsequently on the ecological integrity of the surrounding undeveloped areas, by expanding the negative anthropogenic footprint.

The woody layer along the edges/banks of the watercourse is overwhelmingly dominated by small to medium-height shrub individuals of the woody species *Vachellia karroo* and the shrub species *Asparagus spp.,* while small to medium-height tree individuals of the former species as well as *Ziziphus mucronata* and *Searsia pyroides* were merely found to be sporadically present.

The edges/banks are densely infested with the legally declared alien invasive species *Cestrum lavaegatum* and *Datura stramonium* (both Category 1b). The grass layer is mainly dominated by the hardy Increaser 2 type grass species *Cynodon dactylon* (Van Oudtshoorn, 2022), while the hydrophytic grass species *Paspalum dilatatum* and *P distichum* (Van Oudtshoorn, 2022) were also found to be present but to a lesser extent. Small clusters of the hydrophytic sedge species *Cyperus spp.* were merely found to be sporadically present. This overwhelming dominance of legally declared alien invasive species as well as hardy Increaser 2 type grass species and the virtually complete absence of any desired palatable Decreaser type climax grass species (Van Oudtshoorn, 2022), confirms the disturbed and degraded pioneer ecological state.

Figure 6: Three images illustrating the presence of the significant first-order ephemeral watercourse which traverses the eastern section of the proposed pipeline route and continues in a south-westerly direction and eventually discharges into the Vals River; extensive domestic waste/garbage dumping and dense infestation of legally declared alien invasive species, is visibly evident (red arrows indicate the water flow direction)

The upstream section of the westerly situated watercourse (north of the R727 provincial road) possesses a distinct broad ephemerally active streamflow channel which is completely anthropogenically lined and cladded with rock and cement. The downstream section (south of the R727 provincial road) is however not lined and cladded but rather possesses a distinct narrow deeply-incised/eroded ephemerally active streamflow channel. Due to the artificial lining and cladding, the upstream section possesses a locally distinct seasonal semi-aquatic grassland habitat within the channel and along its edges/banks. Due to the ephemerality and associated lack of continuous natural surface water flow through the local area, the downstream section however possesses no distinct or ecologically important semi-aquatic/riparian habitat or any significant variation in vegetation species composition or -structure, relative to the surrounding terrestrial landscape. It merely houses a slightly increased density representation of woody shrub species within the channel and along its edges/banks, relative to the surrounding terrestrial landscape (100 m surrounding regulated area as no 1:100-year floodline delineation or riparian habitat is available).

The specific section of the watercourse to be traversed by the proposed pipeline route, is associated with the lined and cladded upstream section and is therefore mostly in an anthropogenically transformed ecological state. The same disturbance impacts as discussed for the easterly situated watercourse also apply and the semi-aquatic grassland habitat is therefore in a moderate to highly disturbed and degraded pioneer ecological state.

The semi-aquatic grassland habitat is mainly dominated by the hydrophytic grass species *Paspalum dilatatum* and *P distichum* (Van Oudtshoorn, 2022), while the grass species *Cynodon dactylon, Brachiaria spp.* and hydrophytic sedge species *Cyperus denudatus* are also well-represented. The opportunistic pioneer weed species *Conyza bonariensis, Gomphocarpus fruticosus, Plantago lanceolata* as well as the legally declared alien invasive species *Cestrum lavaegatum, Cirsium vulgare, Datura stramonium* and *Verbena bonariensis* (all Category 1b) are also well-represented.

Similar to the easterly situated watercourse, the woody layer along the edges/banks of the up- and downstream sections is overwhelmingly dominated by small to medium-height shrub individuals of the woody species *Vachellia karroo* and the shrub species *Asparagus spp.,* while small to medium-height tree individuals of the former species as well as *Ziziphus mucronata* and *Searsia pyroides* were merely found to be sporadically present. A single small tree individual of the legally declared alien invasive species *Morus alba* (Category 3) was furthermore also found to be present within the channel directly downstream (south) of the R727 provincial road.

Figure 7: Three images illustrating the presence of the significant first-order ephemeral watercourse which traverses the western section of the proposed pipeline route and continues in a southerly direction and eventually discharges into the Vals River; the anthropogenic rock and cement lining and cladding is visibly evident (red arrows indicate the water flow direction)

6.6. Preferential Water Flow Path/Drainage Line

6.6.1. Aquatic Feature Description and Current Existing Vegetation

A very small first-order ephemeral preferential water flow path/drainage line flows past the assessment area approximately 70 m west at its nearest point. It continues in a southerly direction and eventually discharge into the Vals River. The flow path/drainage line possesses a very small and limited upstream surface water catchment area and consequently merely assists with channelling low volumes of temporary surface water runoff during seasonal rainfall events. It is therefore evident from a hydrological perspective, that the flow path/drainage line does not constitute an important component of the local and broader quaternary surface water catchment- and drainage area.

The upstream section of the flow path/drainage line (north of the R727 provincial road) has been significantly altered by recent anthropogenic excavation and trenching activities and it is channelled through an artificially wet area situated directly adjacent north of the road (see heading 6.7). The downstream section does not possess a distinct active streamflow channel but rather constitutes a merely slight linear surface depression within the landscape. Due to the ephemerality and associated lack of continuous natural surface water flow through the local area, the downstream section of the flow path/drainage line possesses no distinct or ecologically important semi-aquatic/riparian habitat or any significant variation in vegetation species composition or -structure, relative to the surrounding terrestrial landscape (100 m surrounding regulated area as no 1:100-year floodline delineation or riparian habitat is available).

The specific upstream section of the flow path/drainage line associated with the assessment area, is in an anthropogenically transformed ecological state. The same disturbance impacts as discussed for the significant ephemeral watercourses also apply to the downstream section and it is therefore in a moderate to highly disturbed and degraded pioneer ecological state. The flow path/drainage line therefore possesses very low, if any overall long-term ecological/conservational value/significance.

Figure 8: Two images illustrating the presence of the anthropogenically excavated and trenched upstream section (north of the R727 provincial road) of the very small first-order ephemeral preferential water flow path/drainage line, which flows past the assessment area approximately 70 m west at its nearest point and continues in a southerly direction and eventually discharges into the Vals River (red arrows indicate the water flow direction)

Figure 9: Image illustrating the downstream section of the very small first-order ephemeral preferential water flow path/drainage line (south of the R727 provincial road) (red arrow indicates the water flow direction)

6.7. Artificially Wet Areas

6.7.1. Aquatic Feature Description and Current Existing Vegetation

Historical anthropogenic excavation and earthworks likely associated with old borrow pits, are extensively evident throughout the local area directly adjacent north (upstream) of the proposed pipeline route. The altered surface topography and depressions caused by these historical activities have resulted in the formation of a number of artificially wet areas which possess wetland hydric soil characteristics and redoximorphic features. Some of these artificially wet areas are additionally also intermittently fed by raw sewage point-discharge associated with the township portion to the north.

Although these areas constitute artificially induced aquatic features, they still house a degree of locally distinct seasonal semi-aquatic grassland habitat. The same disturbance impacts as discussed for the significant ephemeral watercourses and -preferential water flow path/drainage line also apply and the semi-aquatic grassland habitat is therefore in a highly disturbed and degraded pioneer ecological state. The artificially wet areas therefore possess very low, if any overall long-term ecological/conservational value/significance.

The semi-aquatic grassland habitat is mainly dominated by the hardy Increaser 2 type grass species *Cynodon dactylon* (Van Oudtshoorn, 2022), while the hydrophytic grass- and sedge species *Paspalum dilatatum, P distichum* (Van Oudtshoorn, 2022) and *Cyperus spp.* were also found to be present but to a lesser extent. The opportunistic pioneer weed species *Conyza bonariensis, Gomphocarpus fruticosus, Plantago lanceolata* as well as the legally declared alien invasive species *Cestrum lavaegatum, Cirsium vulgare, Datura stramonium* and *Verbena bonariensis* (all Category 1b) are also well-represented. This overwhelming dominance of opportunistic pioneer weed- and legally declared alien invasive species as well as hardy Increaser 2 type grass species and the virtually complete absence of any desired palatable Decreaser type climax grass species (Van Oudtshoorn, 2022), confirms the disturbed and degraded pioneer ecological state.

Small to medium-height shrub individuals of the woody species *Vachellia karroo* and the shrub species *Asparagus spp.* are moderately present throughout these areas.

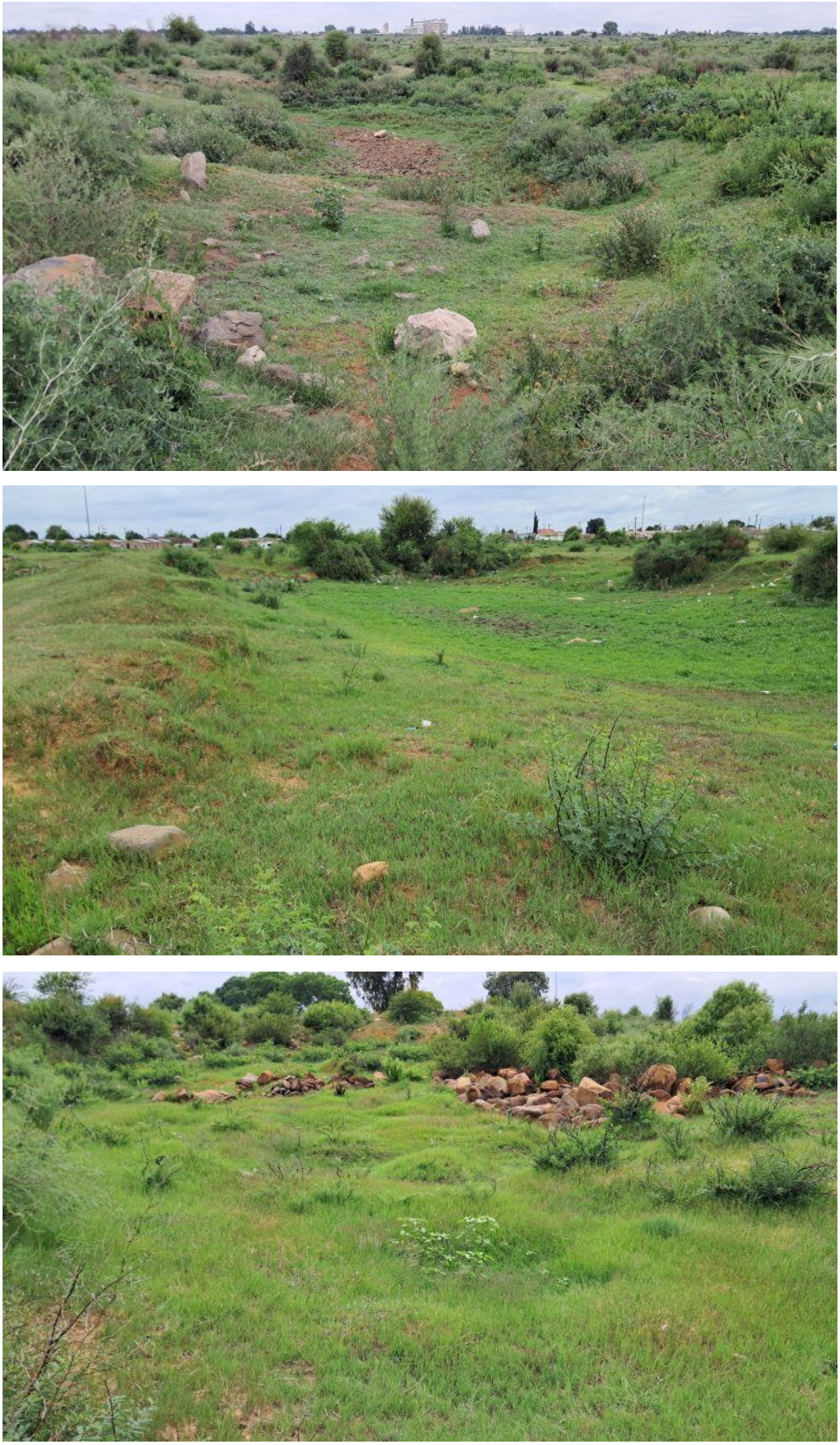

Figure 10: Three images illustrating examples of the artificially wet areas which have formed as a result of extensive historical anthropogenic excavation and earthworks likely associated with old borrow pits, throughout the local area directly adjacent north (upstream) of the proposed pipeline route

Another small separate artificially wet area is situated directly adjacent north of the R727 provincial road in the corner where the road meets the street named 6th Avenue. This area has therefore been historically and anthropogenically formed due to continued inundation pushback from the road intersection impoundment during seasonal rainfall events. It consequently possesses wetland hydric soil characteristics and redoximorphic features.

Although this area constitutes an artificially induced aquatic feature, it still houses a locally distinct seasonal semi-aquatic sedge- and grassland habitat. The area has however been significantly impacted by recent anthropogenic excavation and trenching activities (see heading 6.6). Although this is the case, the ecological condition of the semi-aquatic sedge- and grassland habitat appears to have recovered reasonably favourably over time. The area is however currently still in a slight to moderately disturbed sub-climax ecological state. The artificially wet area therefore merely possesses low overall long-term ecological/conservational value/significance.

The semi-aquatic sedge- and grassland habitat is mainly dominated by dense stands of the hydrophytic sedge species *Cyperus denudatus, C laevigatus, C longus, C sphaerospermus, Ficinia nodosa, Juncus spp., Schoenoplectus brachyceras, S corymbosus* and *S decipiens.* The hydrophytic grass species *Paspalum dilatatum* and *P distichum* (Van Oudtshoorn, 2022) are also well-represented, while the hydrophytic grass species *Eragrostis plana* (Van Oudtshoorn, 2022) was also found to be present but to a lesser extent.

Figure 11: Two images illustrating the presence of the small separate artificially wet area, which is situated directly adjacent north of the R727 provincial road in the corner where the road meets the street named 6th Avenue

As the assessment area technically falls within the 500 m regulated area surrounding all of these identified artificially wet areas, their presence is therefore noted. Due to the proposed development being situated downstream of these areas and/or falling completely outside their surrounding catchments, the proposed development will however not result in any significant direct or indirect impact on the flow regimes of these artificially wet areas. The narrow linear size of the proposed development area is also minute and merely temporary in disturbance nature and the land can be returned to the current state within two years of completion of the construction phase.

6.8. Aquatic Floral Species Conservation

No Red Data Listed-, nationally protected- or provincially protected aquatic plant species or any other aquatic plant species of conservational significance/value, were found to be present throughout the assessment area, during the site assessment.

6.9. Aquatic Faunal and Avifaunal Species Conservation

The moderate to highly disturbed and degraded woody layer and semi-aquatic sedge- and grassland habitats provided by the significant ephemeral watercourses (see heading 6.5) and artificially wet areas (see heading 6.7), could merely be utilised to a very limited extent, by low numbers of common/general- and potentially also habitat-specific aquatic bird-, amphibian- and other aquatic faunal species. The watercourses and artificially wet areas evidently merely constitute low-importance components of the aquatic ecology of the area, from an aquatic faunal biodiversity perspective.

No conservationally significant or important aquatic avifaunal species/nests or other -faunal species were observed throughout the assessment area, during the site assessment. Due to the fragmented as well as moderate to highly disturbed and degraded ecological state of the assessment area along with the continued surrounding anthropogenic activities associated with the town and its township and the presence of the R727 provincial road directly adjacent south, it is therefore also unlikely that the assessment area would specifically be utilised by any conservationally significant or important aquatic faunal or avifaunal species as refuge or for breeding, foraging and/or persistence purposes. The mobility of faunal/avifaunal species allows for individuals to simply leave an area where disturbance is taking place and relocate to surrounding similar, adequate areas. It is anticipated that such species would rather prefer to utilise the undisturbed reasonably natural fully aquatic- and/or riparian habitat associated with the Vals River further away from the town and its township.

It is therefore evident from an aquatic faunal biodiversity perspective, that the assessment area does not constitute an important component of the aquatic ecology of the area. It is consequently not anticipated that the proposed development would pose any significant risk to- or impact on the aquatic faunal or avifaunal communities throughout the local or broader landscape.

6.10. Environmental Screening Tool Rating

It is evident from a hydrological perspective, that the two significant ephemeral watercourses constitute moderate-importance components of the local and broader quaternary surface water catchment- and drainage area. The assessment area does however not constitute an important component of the aquatic ecology of the area, from an aquatic faunal biodiversity perspective.

It is evident from a hydrological perspective, that the single ephemeral preferential water flow path/drainage line does not constitute an important component of the local and broader quaternary surface water catchment- and drainage area or the aquatic ecology of the area.

Based on the outcomes and results of the site assessment, the specialist is therefore in agreement with the 'low' Aquatic Biodiversity Theme sensitivity rating of the assessment area.

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7. Aquatic Ecological Site Sensitivity Map

The aquatic site sensitivity map below (see A3 sized map in the Appendices) illustrates all the identified aquatic ecological features associated with the assessment area.

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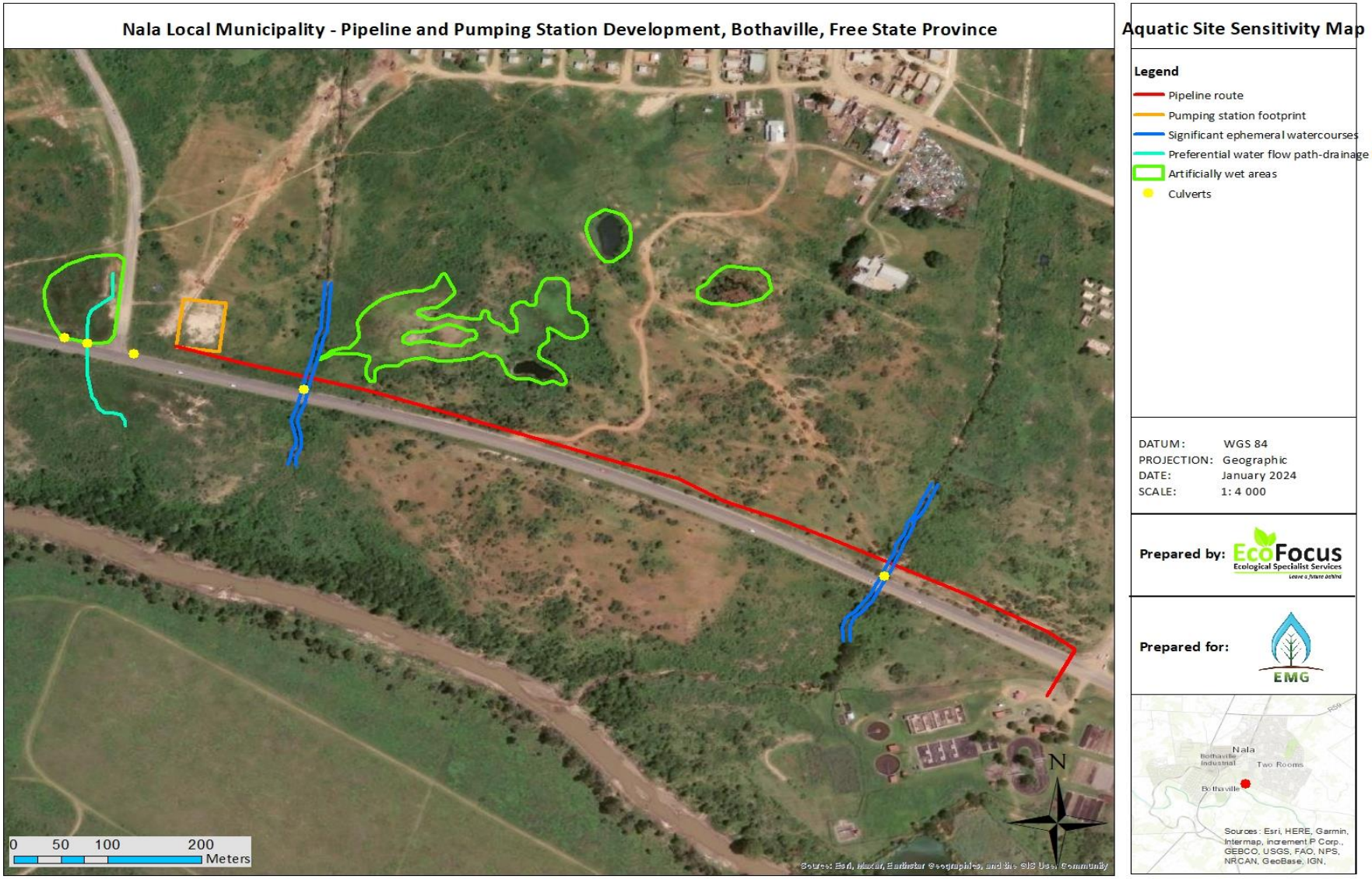

Figure 12: Aquatic site sensitivity map illustrating all the identified aquatic ecological features associated with the assessment area

8. Aquatic Ecological Impact Management and Mitigation

The following main aquatic ecological impact management and mitigation measures are recommended for the proposed development:

- All the applicable requirements in terms of Sections 9 and 10 of GNR 40229: General Authorisation in terms of Section 39 of the National Water Act, 1998 (Act No. 36 of 1998) for Water Uses as Defined in Section 21(c) or Section 21(i), must be adequately implemented for both the construction- and subsequent operational phases of the proposed development.
- Vegetation clearance must be restricted to the narrow linear route of the proposed pipeline, as far as practicably possible.
- The proposed linear development footprint area at the two (2) identified significant ephemeral watercourse crossings must be kept as narrow as practicably possible to reduce the surface impact on the features.
- The proposed pumping station development footprint area must be kept as small as practicably possible to reduce the surface impact on surrounding vegetation and no unnecessary/unauthorised footprint expansion into the surrounding undeveloped landscape may take place.
- No site construction basecamps may be established within the surrounding undeveloped landscape.
- Adequately cordon off the proposed development construction footprint area and ensure that no construction activities, machinery or equipment operate or impact within the surrounding undeveloped landscape outside the cordoned off area.
- Adequate operational procedures for construction machinery and equipment must be developed in order to strictly govern and restrict movement of machinery only within the proposed development construction footprint area and to ensure environmentally responsible construction practices and activities.
- Existing roads and farm tracks in close proximity to the proposed development construction footprint area, must be used during the construction phase. No new temporary roads or tracks may be constructed or implemented through the surrounding undeveloped landscape.
- Disturbed areas within and immediately surrounding the proposed development construction footprint area particularly portions in close proximity to any identified aquatic ecological features and the two (2) identified significant ephemeral watercourse crossings must be adequately rehabilitated concurrently with the construction processes. A Rehabilitation Management Plan must be compiled by a suitably qualified and experienced ecologist.

- It is recommended that a sufficient grazing management plan and practices must be implemented for livestock of the local communities, in order to prevent continued significant overgrazing of the proposed development area and surrounding landscape and to attempt to improve/restore the ecological condition, over time.
- Implement an adequate Alien Invasive Species Management and Prevention Plan during the construction- and subsequent operational phases of the proposed development. Such a Management Plan must be compiled by a suitably qualified and experienced ecologist.
- Implement adequate stormwater and erosion management measures during the construction- and subsequent operational phases of the proposed development. This must be done to sufficiently manage storm water runoff and clean/dirty water separation, in order to prevent any significant soil erosion from occurring within and around the proposed development area and to attempt to maintain the ecological functionality and -integrity of the local and broader quaternary surface water catchment- and drainage area.
- It is recommended that the development design layouts for the proposed pumping station infrastructure, must include adequate stormwater management measures to ensure that sufficient volumes and quality of surface water runoff from the proposed development area during seasonal rainfall events, continue to be channelled through the local catchment/watershed towards the south and south-west.
- Water flow-breaks and dispersal infrastructure should be installed at the water release-points of the of the design layouts. This infrastructure must be able to adequately reduce the water flow velocity and disperse the water over a larger surface area, prior to entering into the surrounding landscape. This is necessary to prevent any potential localised erosion, which could occur at the water release-points due to high water volume concentration and flow velocity build-up. The water flow-breaks and dispersal infrastructure are to be adequately maintained and regularly cleaned out, as and when necessary.

- It is recommended that the construction of the proposed two (2) identified significant ephemeral watercourse crossings be conducted during the winter season as far as practicably possible/feasible. The flow of the watercourses will be significantly reduced during this time, which should ease the excavation activities and result in reduced impeding of- and impact on flow.
- This lower flow during the winter season must however still be adequately diverted/channelled around the construction areas of the proposed two (2) identified significant ephemeral watercourse crossings, in order to ensure continued flow through the area during the construction period. Under no circumstances may the flow of the features be significantly impeded/blocked for any period of time, during construction. This must be done to maintain the local ecological connectivity, -functionality and subsequent -integrity of the semi-aquatic habitats.
- If winter construction is however not practicably possible/feasible, the construction of the proposed two (2) identified significant ephemeral watercourse crossings must be completed within a maximum 5-day period of which the weather forecast predicts no possibility of rainfall.
- A Water Use License Application (WULA)/General Authorisation (GA) must be submitted to the Department of Water and Sanitation for the two (2) identified significant ephemeral watercourse crossings as well as for the proposed development within the 100 m regulated area surrounding the single preferential water flow path/drainage line to the west, as required in accordance with the National Water Act (Act 36 of 1998).
- Implement suitable dust management and prevention measures during the construction phase of the proposed development.
- Construction areas and -roads to be sufficiently wetted down during the construction phase of the proposed development, in order to prevent significant fugitive dust generation and emissions particularly in portions in close proximity to any identified aquatic ecological features and the two (2) identified significant ephemeral watercourse crossings.
- Adequate operational procedures for machinery and equipment must be developed to strictly govern and restrict movement of machinery, in order to avoid unnecessary fugitive dust generation and emissions and ensure environmentally responsible operational practices and activities.

- It is recommended that building materials, hydrocarbons or other chemicals are not to be stored on site as far as practicably possible/feasible.
- If building materials, hydrocarbons or other chemicals are however to be stored on site during the construction phase, the storage areas must be situated as far away as practicably possible/feasible from any identified aquatic ecological features.
- Building material, hydrocarbon and other chemical storage areas must be adequately bunded in order to be able to contain a minimum of 150 % of the capacity of storage tanks/units.
- Adequate hydrocarbon and other chemical storage, handling, usage and spillage clean-up procedures must be developed and all relevant employees must be sufficiently trained on- and apply these procedures during the construction phase.
- Spill kits must be readily available at the construction site. All relevant employees must be adequately trained on the correct procedure and use of the spill kits.
- It is presumed and reasonably expected that the design specifications and size parameters of the proposed sewage pipeline will ensure adequate containment and flow of the required maximum potential volumes of generated raw sewage effluent.
- Adequate sewage spillage clean-up procedures must be developed and all relevant employees must be sufficiently trained on- and apply these procedures during the operational phase.
- Spill kits must be readily available at the WWTW. All relevant employees must be adequately trained on the correct procedure and use of the spill kits.
- Adequate leakage detection and prevention systems must be installed for the sewage pipeline in order to detect any potential leakages and subsequent contamination of the significant ephemeral watercourses and -preferential water flow path/drainage line as well as soil and groundwater resources.
- If any leakages or ruptures of the sewage pipeline occur, the competent authority must immediately be notified and the necessary steps must be followed by the applicant to locate and remediate the source of contamination, as soon as practicably possible/feasible.
- The integrity of the established pipeline must be inspected on a regular basis and adequately maintained over time, in order to ensure its continued functionality and prevent any leakages or ruptures.

9. Water Use License Application (WULA) Risk Assessment Matrix Summary

PROJECT: 02-2025 Nala Local Municipality Pipeline and Pumping Station Development

RISK ASSESSMENT MATRIX for Section 21 (c) and (i) Water Use activities - Version 2.1.1

Name of Assessor: AJH Lamprecht

Signature:

SACNASP Registration Number: 115601

Date of assessment: 17 01 2025

Phase	Activity	Impact	Potentially affected watercourses			Significance (max = 100)	Risk Rating	Confidence level
			Name/s	PES	Overall Watercourse Importance			
CONSTRUCTION	Mechanical clearance and excavation associated with the proposed development of the sewage pipeline sections across the two (2) identified significant ephemeral watercourses.	Terrestrial and aquatic alien invasive species establishment	Two (2) significant ephemeral watercourses	D	Low / Very low	1.6	L	High
	Mechanical clearance and excavation associated with the proposed development of the sewage pipeline sections across the two (2) identified significant ephemeral watercourses.	Contamination by surface material erosion as well as dust generation and emissions	Two (2) significant ephemeral watercourses	D	Low / Very low	0.8	L	Medium
	Mechanical clearance and excavation associated with the proposed development of the sewage pipeline sections across the two (2) identified significant ephemeral watercourses.	Contamination by hydrocarbon and/or other chemical spills/runoff by construction machinery and equipment	Two (2) significant ephemeral watercourses	D	Low / Very low	1.6	L	Medium
	Mechanical clearance and excavation associated with the proposed development of the sewage pipeline sections across the two (2) identified significant ephemeral watercourses.	Impeding of the flow regimes within the associated local and broader quaternary surface water catchment- and drainage area	Two (2) significant ephemeral watercourses	D	Low / Very low	0.8	L	High
	Mechanical clearance and excavation associated with the proposed development of the sewage pipeline sections across the two (2) identified significant ephemeral watercourses.	Transformation and loss of semi-aquatic habitat/vegetation and associated aquatic faunal habitat. The easterly situated watercourse possesses no distinct or ecologically important semi-aquatic/riparian habitat. Due to the artificial lining and cladding, the upstream section of the westerly situated watercourse possesses a locally distinct seasonal semi-aquatic grassland habitat within the channel and along its edges/banks.	Two (2) significant ephemeral watercourses	D	Low / Very low	2	L	High
	Mechanical clearance and excavation associated with the proposed development of the pumping station appromxiately 70 m east of the preferential water flow path/drainage line at its nearest point.	Contamination by dust generation and emissions	First-order ephemeral preferential water flow path/drainage line	D/E	Low / Very low	0.8	L	High
OPERATIONAL	Daily operations of the established sewage pipeline sections across the two (2) identified significant ephemeral watercourses.	Sewage contamination by pipeline leakages/seepages, ruptures, overflows or spillages	Two (2) significant ephemeral watercourses	D	Low / Very low	7.2	L	Medium

10. Conclusion

The significant first-order ephemeral watercourses which will be traversed by the proposed pipeline route, are merely viewed as being of low overall long-term conservational significance/value for the continued ecological functionality and -integrity persistence of the local and broader quaternary surface water catchment- and drainage area in support of the surrounding ecosystem as well as faunal and avifaunal habitats (see heading 6.5).

Due to the very small and limited upstream surface water catchment area of the very small first-order ephemeral preferential water flow path/drainage line which flows past the assessment area approximately 70 m west at its nearest point along with the lack of any distinct or ecologically important semi-aquatic/riparian habitat or any significant variation in vegetation species composition or -structure relative to the surrounding terrestrial landscape, the flow path/drainage line possesses very low, if any overall long-term ecological/conservational value/significance (see heading 6.6).

Although the artificially wet areas house locally distinct seasonal semi-aquatic sedge- and grassland habitat, they however merely possess low overall long-term ecological/conservational value/significance (see heading 6.7). As the assessment area technically falls within the 500 m regulated area surrounding all of these identified artificially wet areas, their presence is therefore noted. Due to the proposed development being situated downstream of these areas and/or falling completely outside their surrounding catchments, the proposed development will however not result in any significant direct or indirect impact on the flow regimes of these artificially wet areas. The narrow linear size of the proposed development area is also minute and merely temporary in disturbance nature and the land can be returned to the current state within two years of completion of the construction phase (see heading 6.7).

It is consequently not anticipated that the proposed development of the assessment area would pose any significant risk to achieving and maintaining national and/or provincial aquatic conservation- and persistence targets of the area or to the continued aquatic ecological connectivity, -functionality and -integrity of the local and broader quaternary surface water catchment- and drainage area.

It is furthermore also not anticipated that the proposed development of the assessment area would pose any significant risk to- or impact on the aquatic faunal or avifaunal communities throughout the local or broader landscape (see heading 6.9).

No significant potential long-term aquatic ecological impacts were identified for the construction phase of the proposed development. Sewage contamination of the significant ephemeral watercourses and -preferential water flow paths/drainage lines as well as sewage contamination of soil and groundwater resources were however identified and addressed as significant potential long-term aquatic ecological impacts associated with the operational phase of the proposed development. These significant potential long-term aquatic ecological impacts identified for the proposed development, could potentially add moderate cumulative impact to the existing negative impacts caused by the extensive existing residential, industrial and commercial transformation associated with the town and its township as well as historical and existing agricultural cropland cultivation transformation, throughout the local and broader surrounding landscape. This local surrounding landscape is however highly fragmented, from an ecological connectivity and -functionality perspective. The narrow linear size of the proposed development area is also minute and merely temporary in disturbance nature and the land can be returned to the current state within two years of completion of the construction phase.

It is furthermore the opinion of the specialist, by application of the NEMA Mitigation Hierarchy, that all the identified potential cumulative aquatic ecological impacts associated with the proposed development, can be suitably reduced and mitigated to within acceptable residual levels, by implementation of the recommended mitigation measures. It is therefore not anticipated that the proposed development will add any significant residual cumulative aquatic ecological impacts to the surrounding environment, if all recommended mitigation measures as per this aquatic ecological report are adequately implemented and managed, for both the construction- and subsequent operational phases of the proposed development.

No potential aquatic ecological fatal flaws were identified for the proposed development. It is therefore the opinion of the specialist from an aquatic ecological perspective, that the proposed development of the assessment area can be considered by the competent authority for Environmental Authorisation and approval. All recommended mitigation measures as per this aquatic ecological report must however be adequately implemented and managed for both the construction- and subsequent operational phases of the proposed development. All necessary authorisations, permits and licenses must also be obtained prior to the commencement of any construction.

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Abbreviated Curriculum Vitae

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- M.Env.Sci Ecological Remediation and Sustainable Utilisation/Vegetation Ecology
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- B.Sc Botany and Zoology (Cum Laude)
  - 2009 - North West University Potchefstroom

Accredited Courses Completed

- Implementing Environmental Management Systems ISO 14001
  - 2011 - North West University Potchefstroom
- Environmental Law for Environmental Managers
  - 2011 - North West University Potchefstroom
- SASS 5 Aquatic Biomonitoring Training Course
  - 2017 – GroundTruth Consulting
- Tools for Wetland Assessment
  - 2023 – GroundTruth Consulting
- Introduction to Wetland Assessments
  - 2023 – GroundTruth Consulting

Professional Registrations

- South African Council for Natural Scientific Professions **(SACNASP)**
  - Professional Ecological Scientist Registration number 115601
- International Association for Impact Assessment **(IAIA)**
  - Registration number 5232
- South African Green Industries Council (**SAGIC**) Invasive Species training
  - Registration number 2405/2459
- South African Wetland Society **(SAWS)**
  - Membership number 220958

Employment and Experience
March 2011 - October 2011
Upon completion of his studies, Rikus started his career in 2011 as an **Environmental Professional in Training (PIT) at Anglo American Thermal Coal: Environmental Services.** He received environmental training and practical implementation experience in all environmental facets of the mining industry with the focus on: Environmental rehabilitation, land management (biodiversity and invasive species eradication), waste & water-, air quality-, game reserve-, environmental management and legislation, as well as corporate reporting. He was also appointed as the Biodiversity Management Custodian at Anglo American Thermal Coal collieries.

November 2011 - November 2015
He was then employed by **Fraser Alexander Tailings as an Environmental Contracts Manager,** where he was responsible for the technical and operational management of all Fraser Alexander Tailings' mining environmental rehabilitation projects. He was responsible for implementation of rehabilitation- and environmental strategies as well as all facets/entire business value chain of project management.

He conducted a significant amount of quantitative and qualitative ecological vegetation monitoring during his employment period with the company. Such monitoring mainly included environmentally rehabilitated mining areas in the open-cast coal-, gold-, platinum- and chrome mining industries situated in the Free State, Gauteng, Mpumalanga, North-West and Limpopo Provinces. He was involved with analysis, processing and interpretation of environmental monitoring data and compilation of high quality technical/scientific environmental monitoring reports for clients. He was subsequently further involved with providing adequate ecological management and maintenance recommendations for rehabilitated areas. He also provided technical/scientific environmental rehabilitation support to mining clients, with regards to sufficient soil preparation and amelioration, grassing processes, as well as grass species mixtures and ratios.

January 2016 - May 2017

He was then employed by **Enviroworks Consulting as a Senior Ecological Specialist** where he was responsible for all Terrestrial and Aquatic Ecological Specialist Assessments and reporting related to Environmental Impact Assessment (EIA) and Basic Assessment (BA) projects. He also completed numerous EIA and BA projects as the main project Environmental Assessment Practitioner (EAP).

June 2017 - Present

Rikus then subsequently established the company EcoFocus Consulting (Pty) Ltd as the owner and Managing Director, which provides high quality professional environmental and ecological specialist services and solutions to the industrial-, construction-, mining-, agricultural-, renewable energy- and other sectors.

He possesses significant qualifications, vast knowledge, skills as well as technical and practical experience in the project management and environmental specialist fields. This, coupled with his disciplined, determined, innovative, goal-driven and solution-oriented mindset as well as exceptional problem-solving-, communication- and people skills along with his high level of personal standards, ensure high quality, timely and outcomes-based outputs and service delivery relating to any project.

Ecological Specialist Assessment and Report Completion

2025

- Aquatic Ecological Compliance Statement for the proposed Obed Nkosi Residential and Attenuation Pond Development, Heidelberg, Gauteng Province.
- Water Use License Application (WULA) Risk Assessment Matrix for the proposed Obed Nkosi Residential and Attenuation Pond Development, Heidelberg, Gauteng Province.
- Water Use License Application (WULA) Risk Assessment Matrix for the proposed 1 200 m^2 Erf 2103 Upington Single Residential Development, Northern Cape Province.

2024

- Proposed 0.53 ha Springbok Residential and Hospitality Development, Northern Cape Province.
- Proposed 4 ha Ingenio Academy School Development, Vanderbijlpark, Gauteng Province.
- Proposed 46.2 ha Donkerhoek Residential Development, Kimberley, Northern Cape Province.
- Ecological Compliance Statement for the proposed 28.9 ha Bloemspruit Small Holdings Residential Development, Bloemfontein, Free State Province.

- Proposed 26 ha Kestell Waste Water Treatment Works Development, Free State Province.
- Ecological Compliance Statement for the proposed 16.6 ha Poding Tse Rolo Residential Development, Philippolis, Free State Province.
- Ecological Compliance Statement for the proposed 18.9 ha Oranjekrag Residential Development, Free State Province.
- Ecological Compliance Statement for the proposed 64.6 ha Phaliso Residential Development, Trompsburg, Free State Province.
- Aquatic Ecological Site Verification Report for the proposed 643 ha Sol Platz PV Solar Power Generation Facility Development, Bloemfontein, Free State Province.
- Proposed 129 ha Farm No. 2727 Residential Development, Bloemfontein, Free State Province.
- Water Use License Application (WULA) Risk Assessment for the proposed 80 MW Khauta West Solar PV Facility Development substation, Riebeeckstad, Free State Province.
- Water Use License Application (WULA) Risk Assessment for the proposed 110 MW Khauta South Solar PV Facility Development substation, Riebeeckstad, Free State Province.
- Water Use License Application (WULA) Risk Assessment for the proposed 165 MW Khauta North Solar PV Facility Development substation, Riebeeckstad, Free State Province.
- Water Use License Application (WULA) Risk Assessment Exemption Letter for the proposed Khauta Solar PV Facility Cluster Development, Riebeeckstad, Free State Province.
- Ecological Site Sensitivity Verification Report for the proposed 793.21 ha Matjhabeng Local Municipality Residential Developments, Welkom, Free State Province.
- Proposed 285 ha Project 6 Residential Development, Kimberley, Northern Cape Province.
- Ecological Compliance Statement for the proposed 6.79 ha Bloemhof Mall Development, North West Province.
- Ecological Compliance Statement for the proposed 1.18 ha Farm Wildealskloof No. 1205 Poultry Abattoir & Piggery Development, Bloemfontein, Free State Province.
- Aquatic Ecological Compliance Statement for the proposed 5 km Kookfontein to Ellendale Road Upgrade, Northern Cape Province.
- Water Use License Application (WULA) Risk Assessment Matrix for the proposed 5 km Kookfontein to Ellendale Road Upgrade, Northern Cape Province.
- Aquatic Ecological Compliance Statement for the proposed 4 km Ga-Hohuwe to Dithakong Road Upgrade, Northern Cape Province.
- Water Use License Application (WULA) Risk Assessment Matrix for the proposed 4 km Ga-Hohuwe to Dithakong Road Upgrade, Northern Cape Province.

- Ecological Compliance Statement for the proposed 21.02 ha Sasolburg to Heilbron Road Borrow Pit Developments, Free State Province.
- Watercourse and Wetland Audit for the proposed 18.73 ha Nketoana Local Municipality Geluk Dam Development, Reitz, Free State Province.
- Rehabilitation and Alien Invasive Species Management Plan for the proposed 18.73 ha Nketoana Local Municipality Geluk Dam Development, Reitz, Free State Province.
- Aquatic Biodiversity Theme Compliance Statement for the proposed 19 km Orange River Solar Facility 132 kV Transmission Line Development, Groblershoop, Northern Cape Province.
- Water Use License Application (WULA) Risk Assessment Matrix for the proposed 19 km Orange River Solar Facility 132 kV Transmission Line Development, Groblershoop, Northern Cape Province.
- Watercourse/Wetland Buffer Zone Review for the proposed 94.4 ha Marikana Residential Development, Ladybrand, Free State Province.
- Water Use License Application (WULA) Risk Assessment Matrix for the proposed 94.4 ha Marikana Residential Development, Ladybrand, Free State Province.
- Terrestrial Ecological Compliance Statement for the proposed 12.6 ha Mall of Kroonstad Shopping Centre Development, Free State Province.
- Ecological Compliance Statement for the proposed 14.39 ha Sasolburg to Koppies Road Borrow Pit Developments, Free State Province.
- Proposed 190 ha Kwanonzame Residential Development, Middelburg, Eastern Cape Province.
- Water Use License Application (WULA) Risk Assessment Matrix for the proposed 190 ha Kwanonzame Residential Development, Middelburg, Eastern Cape Province.
- Proposed 177 ha Midros Residential Development, Middelburg, Eastern Cape Province.
- Water Use License Application (WULA) Risk Assessment Matrix for the proposed 177 ha Midros Residential Development, Middelburg, Eastern Cape Province.
- Rehabilitation and Alien Invasive Species Management Plan for the proposed 18.2 ha Nketoana Local Municipality WWTW Development, Lindley, Free State Province.
- Proposed 4.32 ha Phahamisa Agricultural Cooperative Piggery Development, Kroonstad, Free State Province.
- Ecological Compliance Statement for the proposed 0.49 ha Grootvlei Poultry Hatchery Development, Kroonstad, Free State Province.
- Proposed 4.8 km Prieska Power Reserve Water and Sewage Pipeline Developments, Northern Cape Province.

- Water Use License Application (WULA) Risk Assessment Matrix for the proposed 4.8 km Prieska Power Reserve Water and Sewage Pipeline Developments, Northern Cape Province.
- Ecological Compliance Statement for the proposed 5.38 ha Farm De Hoop No. 320 Poultry Layer Houses Development, Bloemfontein, Free State Province.
- Ecological Compliance Statement for the proposed 4.99 ha Jan Nico Goliath Tiger-eye Mining Development, Griekwastad, Northern Cape Province.
- Water Use License Application (WULA) Risk Assessment Matrix for the proposed 4.99 ha Jan Nico Goliath Tiger-eye Mining Development, Griekwastad, Northern Cape Province.
- Ecological Compliance Statement for the proposed 2.5 ha Northern Cape Truckers Tiger-eye Mining Development, Griekwastad, Northern Cape Province.
- Water Use License Application (WULA) Risk Assessment Matrix for the proposed 2.5 ha Northern Cape Truckers Tiger-eye Mining Development, Griekwastad, Northern Cape Province.
- Terrestrial and Aquatic Ecological Impact Assessment Review for the proposed 87 ha Khauta e Nyane 50 MW Solar PV Energy Facility Development, Riebeeckstad, Free State Province.
- Terrestrial and Aquatic Ecological Impact Assessment Review for the proposed 273 ha Khauta North 165 MW Solar PV Energy Facility Development, Riebeeckstad, Free State Province.
- Terrestrial and Aquatic Ecological Impact Assessment Review for the proposed 168 ha Khauta South 110 MW Solar PV Energy Facility Development, Riebeeckstad, Free State Province.
- Terrestrial and Aquatic Ecological Impact Assessment Review for the proposed 101 ha Khauta West 80 MW Solar PV Energy Facility Development, Riebeeckstad, Free State Province.
- Ecological Compliance Statement for the proposed 1.5 ha Eskom Masimong 132kV Switching Station Development, Riebeeckstad, Free State Province.
- Ecological Compliance Statement for the proposed 900 m Batlharo Bridge Development, Northern Cape Province.
- Water Use License Application (WULA) Risk Assessment Matrix for the proposed 900 m Batlharo Bridge Development, Northern Cape Province.
- Ecological Compliance Statement for the proposed 8.13 ha Pilane Milling Plant Development, Vredefort, Free State Province.
- Ecological Compliance Statement for the proposed 3.72 ha Pilane Poultry Broiler Houses and Abattoir Development, Potchefstroom, North West Province.
- Proposed 62.4 ha Kismet Agri-Industrial Park Development, Vrede, Free State Province.
- Water Use License Application (WULA) Risk Assessment Matrix for the proposed 62.4 ha Kismet Agri-Industrial Park Development, Vrede, Free State Province.

- Terrestrial and Aquatic Ecological Impact Assessment Review for the proposed 12.8 km Khauta 132 kV Overhead Powerline Development, Riebeeckstad, Free State Province.
- Ecological Compliance Statement for the proposed 1 ha CC Chickens Abattoir Rendering Plant Development, Kroonstad, Free State Province.
- Ecological Compliance Statement for the proposed 4 ha Itau Milling Plot 48 Milling Plant Development, Bloemfontein, Free State Province.
- Proposed 247 ha Namahadi Residential Development, Frankfort, Free State Province.
- Water Use License Application (WULA) Risk Assessment Matrix for the proposed 247 ha Namahadi Residential Development, Frankfort, Free State Province.
- Ecological Compliance Statement for the proposed 17.8 ha Leander Substation Battery Energy Storage System (BESS) Development, Riebeeckstad, Free State Province.
- Water Use License Application (WULA) Risk Assessment Matrix for the proposed 17.8 ha Leander Substation Battery Energy Storage System (BESS) Development, Riebeeckstad, Free State Province.
- Aquatic Ecological Compliance Statement for the proposed 44 km N1 National Highway Section Upgrade, Zandkraal to Winburg, Free State Province.
- Grazing and Invasive Species Assessment for the Farm Kareeboom No. 1191 outside Paul Roux, Free State Province.
- Aquatic Ecological Compliance Statement for the proposed 179 ha Groblershoop PV Solar Power Generation Facility & Battery Energy Storage System (BESS) Development, Northern Cape Province.
- Water Use License Application (WULA) Risk Assessment Matrix for the proposed 179 ha Groblershoop PV Solar Power Generation Facility & Battery Energy Storage System (BESS) Development, Northern Cape Province.
- Ecological Compliance Statement for the proposed 14.4 ha Farm Mier No. 585 Hospitality Resort Development, Northern Cape Province.
- Aquatic Ecological Compliance Statement for the proposed Impumelelo Residential and Attenuation Pond Development, Devon, Gauteng Province.
- Water Use License Application (WULA) Risk Assessment Matrix for the proposed Impumelelo Residential and Attenuation Pond Development, Devon, Gauteng Province.
- Ecological Compliance Statement for the proposed 7.22 ha Welgegund Borrow Pit Development, Excelsior, Free State Province.
- Protected plant environmental screening for the proposed 18.23 km Mangaung Metropolitan Municipality Design, Documentation and Supervision of IPTN Road Infrastructure, Bloemfontein, Free State Province.

PHASE 1 HERITAGE IMPACT ASSESSMENT OF A PROPOSED NEW PUMPSTATION AND GRAVITY MAIN PIPELINE ON THE FARM BOTHARNIA NEAR BOTHAVILLE, FREE STATE PROVINCE.

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Declaration of Independence
Paleo Field Services maintains complete financial independence in its operations and consultancy. It holds no financial interest, either currently or prospectively, in the activities or outcomes of the projects it is engaged in, beyond the professional remuneration for services rendered. The sole source of financial remuneration for Paleo Field Services arises strictly and exclusively from the work performed, as outlined and agreed upon in the terms of reference for each project or consultancy engagement. Paleo Field Services accepts information supplied by the client as accurate.
Yours truly,

March 2025

SUMMARY

A Phase 1 Heritage Impact Assessment was carried out for the construction of a new pumpstation and ~1 km-long gravity main pipeline in Bothaville, Free State Province. The pipeline will connect the new pumpstation with the Bothaville Water Treatments Works. The ~0.65 ha pumpstation area and ~1 km – long gravity main footprint are capped by well-developed loamy to sandy soils and river gravel deposits causing low outcrop visibility for palaeontologically significant Ecca Group mudrocks. The footprints also lie on severely degraded terrain where no aboveground evidence of Quaternary fossils, stonewalled structures, buildings older than 60 years, rock engravings or material of cultural significance, graves or *in situ* archaeological sites were observed.

- The proposed impact will have negligible negative effects on *palaeontological heritage* and the development can proceed, but it is advised that, if trenching reveals intact or freshly exposed mudrock / shale below the overlying soils during the construction phase of the development, a professional palaeontologist should be appointed to monitor for plant, invertebrate and trace fossils (= site rating of Generally Protected B: Mitigation before destruction).
- The proposed impact will have negligible negative effects on *archaeological heritage* (= site rating of Generally Protected C: Destruction).

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INTRODUCTION

A Phase 1 Heritage Impact Assessment was carried out for the construction of a new pumpstation and ~1 km-long gravity main pipeline in Bothaville, Free State Province (**Fig. 1**). The assessment is required as a prerequisite for new development in terms of the National Heritage Resources Act (NHRA) 25 of 1999. The NHRA identifies what is defined as a heritage resource, the criteria for establishing its significance and lists specific activities for which a heritage specialist study may be required. The NHRA prescribes a system of grading of places/objects via Section 7 and makes provision for the general protection of heritage resources via Sections 34, 35, 36, and 37 (in respect of the built environment, archaeology/ palaeontology, burial grounds/graves and monuments/memorials, respectively), while Section 38 sets out guidelines under which heritage impact assessments are required when new developments may impact upon heritage resources. In this case, the proposed development triggered Section 38(1) of the Act where proposed development includes *the construction of a road, wall, powerline, pipeline, canal or other similar form of linear*

development or barrier exceeding 300m in length or any development which will change the character of a site exceeding 5 000 m^2 in extent.

LOCALITY DATA

Map Reference: 1:50 000 topographical map 2726BC Bothaville and 1:250 000 geological map 2726 Kroonstad.

The new ~0.65 ha pumpstation area and ~1 km-long gravity main pipeline are located next to the R727 provincial road about 1.8 km east of the Bothaville CBD. The pipeline traverses mostly degraded terrain flanking the provincial road and will link the new pumpstation to the existing Bothaville water treatment works located ~200 m north of the right bank of the Vals River (**Fig. 2 & 3**).

General site coordinates (**Fig. 2**):

Pumpstation Area (~0.65 ha): 27°23'18.96"S 26°38'2.20"E
Gravity Main Pipeline A): 27°23'20.09"S 26°38'3.99"E
Gravity Main Pipeline B): 27°23'31.18"S 26°38'33.56"E
Gravity Main Pipeline C): 27°23'32.85"S 26°38'32.72"E

ASSUMPTIONS AND LIMITATIONS

The development footprint is located on partially disturbed terrain capped by deep Quaternary soils, with the expectation that palaeontological and archaeological visibility should be low and high respectively.

METHODOLOGY

A site assessment was conducted in accordance with the NHRA (No 25 of 1999) and SAHRA Minimum Standards for Archaeological and Palaeontological components of Impact Assessment Reports. The site was rated using existing field data, database information and published literature. This was followed by personal observation via foot surveys with access by motor vehicle. A Garmin Etrex Vista GPS hand model (set to the WGS 84 map datum) and a digital camera were used for recording purposes.

Terms of Reference

- Conduct site assessment to identify and map heritage sites and occurrences in the affected area(s) and provide an assessment of their significance.
- Conduct site assessment to determine and assess impacts of the proposed development on heritage resources relative to the sustainable social and economic benefits to be derived from the development if planned impacts will result in the loss of any resources.
- Provide a system of grading of places and objects which form part of the national estate, and which distinguishes between at least the categories as prescribed under Section 7 of the NHRA — (a) Grade I: Heritage resources with qualities so exceptional that they are of special national significance; *(b)* Grade II: Heritage resources which can be considered to have special qualities which make them significant within the context of a province or a region; and *(c)* Grade III: Other heritage resources worthy of conservation (**see Table 2**).
- Recommend mitigation measures to minimize potential impacts associated with the proposed development, if any.

BACKGROUND

Palaeontology

Potential palaeontological occurrences: Permian plant fossils associated with shales; Quaternary vertebrate fossils associated with late Pleistocene alluvial (fluviatile) deposits.

Underlying geology in the region is represented late Palaeozoic Karoo Supergroup remnants (Ecca Group shales, sandstone) and intrusive dolerites of the Mesozoic Karoo Igneous Province, capped by well-developed Quaternary sandy deposits and fluviatile sediments associated with the nearby Vals River (*Qs*, **Fig. 5**). The study area is underlain by palaeontologically significant fluvial and deltaic deposits of fine-grained mudstones and shales with alternating layers of coal seams of the Permian Vryheid Formation (Ecca Group, Karoo Supergroup) (**Fig. 3**). The Vryheid Formation is known for its abundant coal deposits. Well-preserved plant fossils are commonly found in the shales associated with the coal seams (Anderson and Anderson 1985). A wealth of plant fossils is recorded from this formation, including the well-known Glossopteris Flora (including lycopods, rare ferns and horsetails,

cordaitaleans, conifers and ginkgoaleans). Abundant, low diversity trace fossils, rare insects, possible conchostracans, non-marine bivalves and fish scales have also been reported from this formation (MacRae, 1999). Unconformably overlying Quartenary overbank deposits may contain mammal vertebrate fossils associated with late Pleistocene alluvial sediments derived from the nearby Vals River.

Archaeology

Potential archaeological occurrences: Intact Stone Age open sites associated with Vals River overbank sediments; unmarked graves, kraals & historical stone – built structures.

Overbank sediments (alluvium) of the Vals River are well known for occasionally yielding Middle and Later Stone Age capped assemblages. Stylistically diagnostic Type Z settlements are scattered over a relatively limited area to along the Vals River in the districts of Kroonstad and Bothaville, including a few sites on the Renoster River, east of Viljoenskroon. Type Z dwellings consisted of a cylindrical hut with stone-walled courtyards at the front and rear, representing a bilobial layout. Maggs (1976) ascribes the occupation of the sites with bilobial dwellings to early Sotho-speaking Thlaping and Rolong groups who occupied the region from the 17th to early 19th century. There are plentiful rock art sites with engravings recorded in the Lower Vaal River Basin including the area north of Bothaville on the farms Deelfontein, Diepfontein, Doornhoek and Geelfontein. European settlement occurred from 1836 (Voortrekkers) while establishment of the Boer republics and the discovery of diamonds and gold further contributed to the distinctive historical character of the region. Bothaville was laid out in 1891 on the farm Gladdedrift by Theunis Botha who planned to call it Botharnia. South African War remnants are represented by a memorial commemorating the Battle of Doornkraal (November 1900) and Boer mass graves located ~8 km southwest of Bothaville.

FIELD ASSESSMENT

The ~0.65 ha pumpstation and ~1 km – long gravity main footprints are capped by well-developed loamy to sandy soils and river gravel deposits causing low outcrop visibility for palaeontologically significant Ecca Group mudrocks as indicated on the 1:250 000 scale geological map of the region (**Fig.**) The footprints also lie on severely degraded terrain where no aboveground evidence of Quaternary fossils, stonewalled structures, buildings older than

60 years, rock engravings or material of cultural significance, graves or *in situ* archaeological sites were observed.

IMPACT STATEMENT AND RECOMMENDATIONS

The proposed impact will have negligible negative effects on palaeontological heritage and the development can proceed, but it is advised that, if trenching reveals intact or freshly exposed mudrock / shale below the overlying soils during the construction phase of the development, a professional palaeontologist should be appointed to monitor for plant, invertebrate and trace fossils (= site rating of Generally Protected B: Mitigation before destruction, **Table 1 & 2**). The proposed impact will have negligible negative effects on archaeological heritage (= site rating of Generally Protected C: Destruction, **Table 2**).

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TABLES & FIGURES

Table 1. Impact rating table summarizing potential palaeontological and archaeological impacts on a scale of 1 to 4. Calculation of the significance of an impact uses the following formula: (Extent + probability + reversibility + irreplaceability + duration + cumulative effect) x magnitude = 6-28 (Low), 29-50 (Moderate), 51-73 (High) and 74-96 (Very High).

Points	Impact significance rating	Description
6 to 28	Low impact	The anticipated impact will have negligible negative effects and will require no mitigation.
29 to 50	Moderate impact	The anticipated impact will have moderate negative effects and will require moderate mitigation measures.
51 to 73	High impact	The anticipated impact will have significant effects and will require significant mitigation measures to achieve an acceptable level of extenuation.
74 to 96	Very high impact	The anticipated impact will have highly significant effects and are unlikely to be able to be mitigated adequately. These impacts could be considered "fatal flaws".

Context	PALAEONTOLOGY PUMPSTATION	ARCHAEOLOGY PUMPSTATION	PALAEONTOLOGY PIPELINE	ARCHAEOLOGY PIPELINE
Extent	Site = 1 The impact will only affect the footprint	Site = 1 The impact will only affect the footprint	Site = 1 The impact will only affect the footprint	Site = 1 The impact will only affect the footprint
Probability	Possible = 2 The impact may occur (Between a 25% to 50%	Unlikely = 1 The chance of the impact occurring is extremely low	Possible = 2 The impact may occur (Between a 25% to 50%	Unlikely = 1 The chance of the impact occurring is extremely low

	chance of resources if trenching reveals intact or freshly exposed mudrock below the overlying soils.	(Less than a 25% chance of occurrence).	chance of resources if trenching reveals intact or freshly exposed mudrock below the overlying soils.	(Less than a 25% chance of occurrence).
Duration	Permanent = 4 Impact considered indefinite	Permanent = 4 Impact considered indefinite	Permanent = 4 Impact considered indefinite	Permanent = 4 Impact considered indefinite
Magnitude	Moderate = 2 Impact (in case of trenching) could alter the quality of the resource but still maintains general integrity.	Low = 1 Impact affects the quality and integrity of the resource in a way that is barely perceptible.	Moderate = 2 Impact (in case of trenching) could alter the quality of the resource but still maintains general integrity.	Low = 1 Impact affects the quality and integrity of the resource in a way that is barely perceptible.
Reversibility	Partly reversible = 2 Impact is partly reversible with application of appropriate mitigation measures.	Completely reversible = 1 Impact is neutral or reversible with implementation of minor mitigation measures.	Partly reversible = 2 Impact is partly reversible with application of appropriate mitigation measures.	Completely reversible = 1 Impact is neutral or reversible with implementation of minor mitigation measures.
Irreplaceable loss	Marginal loss of resource = 2 The impact could result in marginal	No loss of resource = 1	Marginal loss of resource = 2 The impact could result in marginal	No loss of resource = 1

	loss of resources if trenching reveals intact or freshly exposed mudrock below the overlying soils	The impact will not result in the loss of any resources.	loss of resources if trenching reveals intact or freshly exposed mudrock below the overlying soils	The impact will not result in the loss of any resources.
Cumulative Impacts	Negligible = 1 The impact would result in negligible to no cumulative effects on resource.	Negligible = 1 The impact would result in negligible to no cumulative effects on resource.	Negligible = 1 The impact would result in negligible to no cumulative effects on resource.	Negligible = 1 The impact would result in negligible to no cumulative effects on resource.
Significance	**Low = 24** The anticipated impact will have negligible negative effects but may require minor mitigation during construction phase of the development.	**Low = 9** The anticipated impact will have negligible negative effects and will require minor to no mitigation prior to development.	**Low = 24** The anticipated impact will have negligible negative effects but may require minor mitigation during construction phase of the development.	**Low = 9** The anticipated impact will have negligible negative effects and will require minor to no mitigation prior to development.

Table 2. Description of Field Rating categories as prescribed in Section 7(1) of the NHRA where SAHRA*, in consultation with the Minister and the MEC of every province, must by regulation establish a system of grading of places and objects which form part of the national estate, and which distinguishes between at least the categories— (a) Grade I: Heritage resources with qualities so exceptional that they are of special national significance; (b) Grade II: Heritage resources which, although forming part of the national 35 estate, can be considered to have special qualities which make them significant within the context of a province or a region; and (c) Grade III: Other heritage resources worthy of conservation.*

Field Rating	**Grade (NHRA No. 25 of 1999, Section 7)**	**Significance**	**Mitigation**
National Significance (NS)	Grade 1	-	Conservation: national site nomination
Provincial Significance (PS)	Grade 2	-	Conservation: provincial site nomination
Local Significance (LS)	Grade 3A	High significance	Conservation: mitigation not advised
Local Significance (LS)	Grade 3B	High significance	Mitigation (part of site should be retained)
Generally Protected A (GP.A)	-	High/medium significance	Mitigation before destruction
Generally Protected B (GP.B)	-	Medium significance	Recording before destruction
Generally Protected C (GP.C)	-	Low significance	Destruction

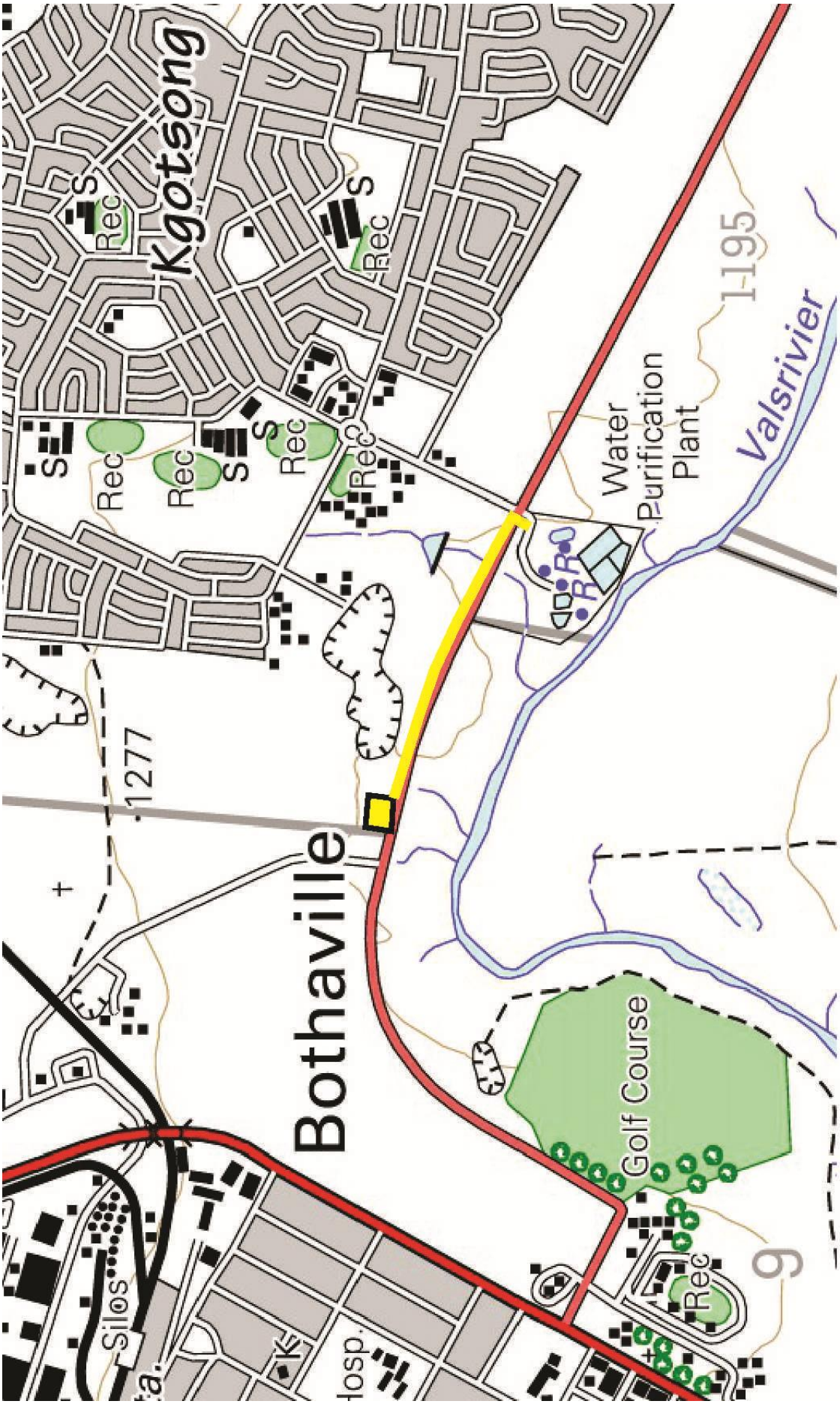

Figure 1. Development footprint marked on portion of 1:50 000 scale topographic map 2726BC Bothaville.

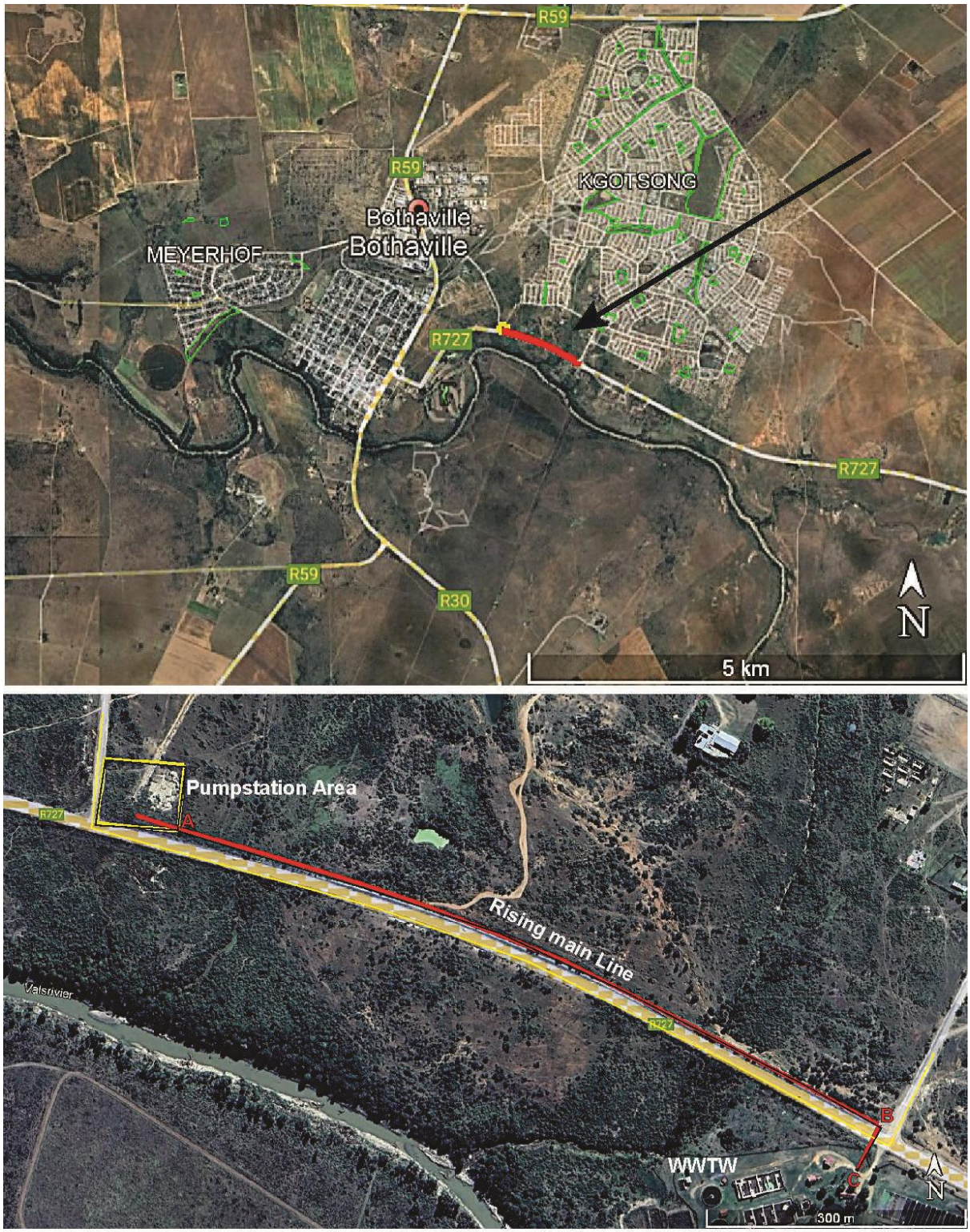

Figure 2. Aerial view of the proposed development footprint.

Figure 3. General view of the Pumpstation site, looking south (above left), the Pipeline footprint looking southeast (above right), northwest (below left) termination point at the Water Treatment Works (below right).

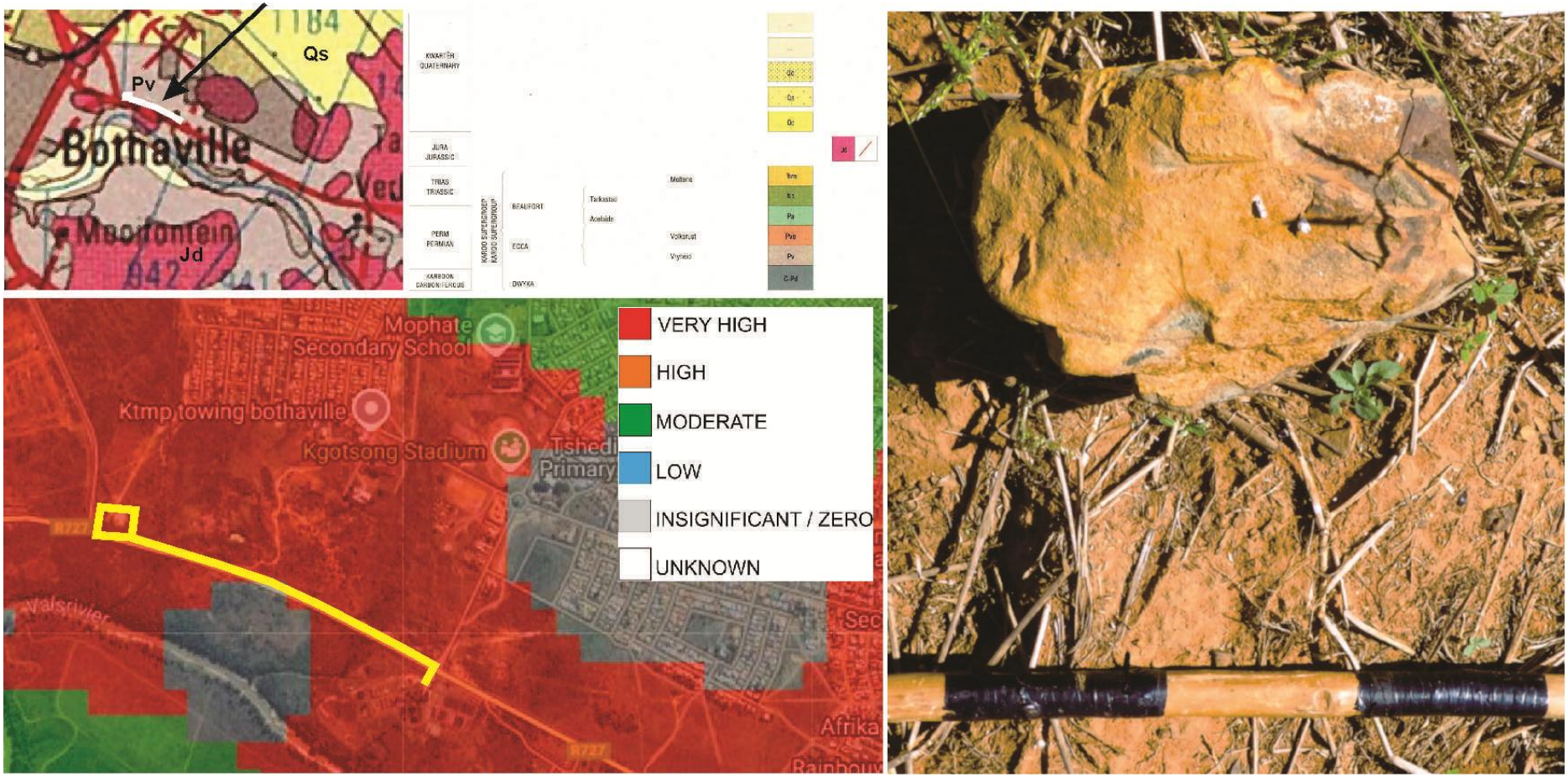

Figure 4. Development footprint marked on portion of 1:250 000 scale geological map 2726 Kroonstad (above left) and portion of SAHRIS palaeosensitivity map (below left). An isolated mudrock surface find pictured right (scale 1 = 10 cm).

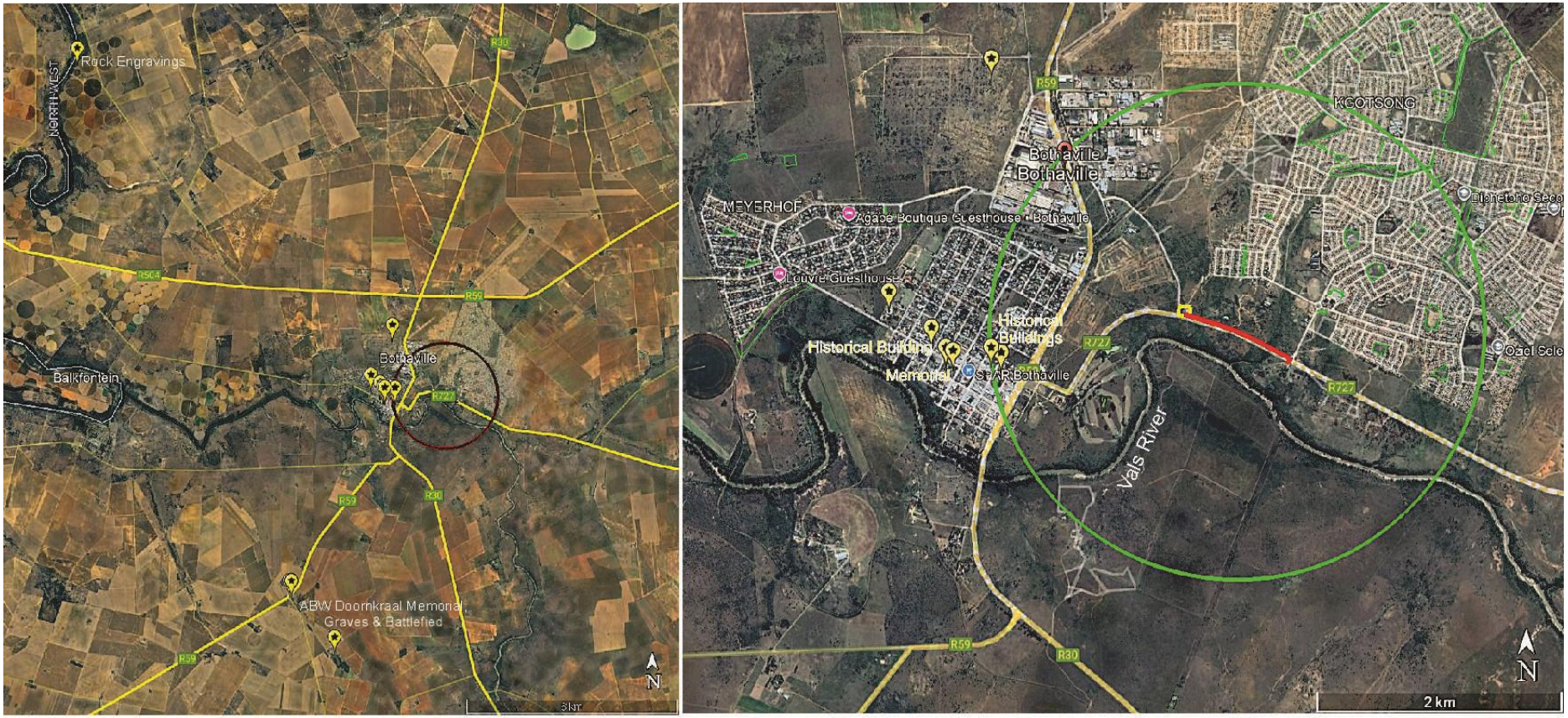

Figure 5. Distribution of heritage finds/features (yellow icons) previously recorded in the vicinity of Bothaville. Circle indicates 2 km radius around development footprint.

APPENDIX 1 - CHANCE FINDS PROTOCOL FOR DEVELOPER

Identification of anomalous / irregular shapes or forms on the landscape or in rocks is a first step in recognizing potential fossil remains or fossil-bearing landforms in the field. Vertebrate fossils in Quaternary sediments may resemble modern-looking long bones, horn cores and teeth (**Fig. 6**). If material proves to be significant, a Phase 2 rescue operation may be required subject to permits issued by SAHRA. The decision regarding the EA Application must be communicated to SAHRA and uploaded to the SAHRIS Case application. In the meantime, excavated or removed remains must be wrapped in paper towels or heavy-duty tin foil and stored in a safe place. The material should not be washed or cleaned in any way. Undisturbed material must be kept in place and protected from further damage by covering it with a light but rigid object like a box, bucket or metal sheet if possible and the area must be avoided by implementing a no-go buffer zone until further confirmation by a heritage specialist.

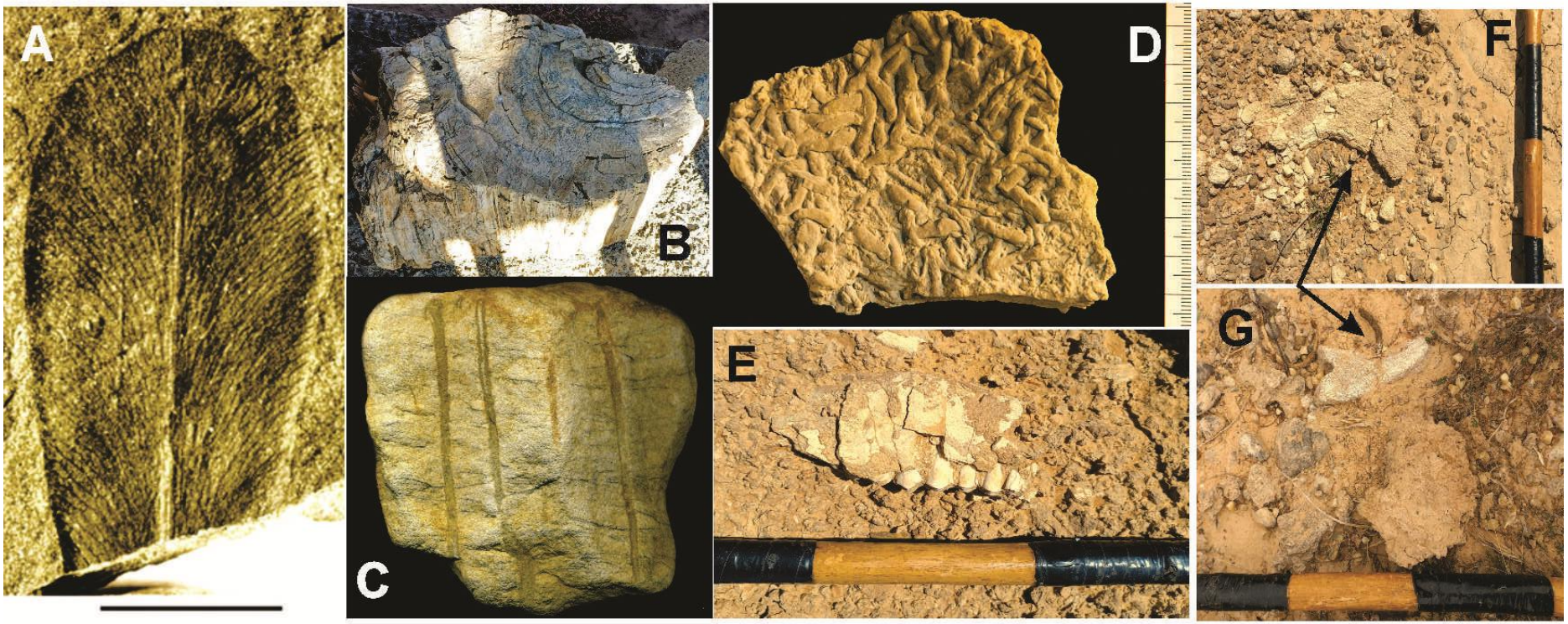

Figure 6. Easily recognizable features likely indicative of fossil remains within Ecca Group rocks include plant remains and petrified wood (A, B) and trace fossils (C, D). Vertebrate fossil remains to look out for in unconsolidated over bank deposits may include long bones, horn cores or teeth fragments resembling odd looking and generally light-coloured stone-like objects (E, F & G).

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Environmental Management Group (PTY) LTD.

March 2025

SITE SENSITIVITY AND TERRESTRIAL ECOLOGY COMPLIANCE STATEMENT REPORT

COMPILED FOR THE PROPOSED DEVELOPMENT OF THE BOTHARINIA 9 PHASE 2 PUMP STATION AND PIPELINE, BOTHAVILLE, FREE STATE PROVINCE

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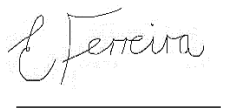
Declaration of independence:

I, the above-mentioned specialist investigator responsible for conducting this particular specialist ecological study, declare that

- I consider myself bound to the rules and ethics of the South African Council for Natural Scientific Professions (SACNASP);
- At the time of conducting the study and compiling this report I did not have any interest, hidden or otherwise, in the proposed development, except for financial compensation for work done in a professional capacity;
- Work performed for this study was done in an objective manner. Even if this study results in views and findings that are not favourable to the client/applicant, I will not be affected in any manner by the outcome of any environmental process of which this report may form a part;
- I declare that there are no circumstances that may compromise my objectivity in performing this specialist investigation. I do not necessarily object to or endorse the proposed development, but aim to present facts, findings and recommendations based on relevant professional experience, and scientific data;
- I do not have any influence over decisions made by the governing authorities;
- I have the necessary qualifications and guidance from professional experts (registered Pr. Nat. Sci.) in conducting specialist reports relevant to this application, including knowledge of the Act, regulations and any guidelines that have relevance to the proposed activity
- This document and all information contained herein are and will remain the intellectual property of Environmental Management Group. This document, in its entirety or any portion thereof, may not be altered in any manner or form, for any purpose without the specific and written consent of the respective specialist investigator.



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Ricus Nel

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Executive summary:

A development of a pump station and pipeline is proposed within a 2.5 km radius of Bothaville. The proposed development requires environmental authorisation in terms of the National Environmental Management Act (Act No. 10 of 1998), 2014.

As per the DFFE screening tool, the proposed development area will affect an area with a low sensitivity for the terrestrial biodiversity theme. This report found the site to be of low sensitivity. Thus, a terrestrial biodiversity compliance statement is required.

As part of the environmental authorisation requirements, this document serves as a terrestrial biodiversity compliance statement for the proposed development site. This compliance statement aligns with NEMA procedures for the assessment and minimum criteria for reporting on identified environmental themes when applying for environmental authorisation (NEMA, 2020).

This report aims to verify and evaluate the present-day in situ environmental conditions of the receiving environment at the location of the proposed development area. Additionally, this report assesses the anticipated environmental impacts of the proposed development on the receiving environment and provides recommendations and mitigation measures.

Although the vegetation on site remains largely natural, the disturbances such as the long term occurrence of topsoil disturbance activities have a marked effect on the vegetation. However, the site is found to be in good ecological functioning and overall good species richness.

The vegetation of the proposed development shares similarities with the Highveld Alluvial Vegetation vegetation type in both composition and structure. Thus the vegetation on site agrees with the vegetation type description (Mucina and Rutherford, 2006). However, this vegetation type's conservation status is Least Concern (LC)

No floral SCC, nationally or provincially protected species observed within the proposed development area. Despite no confirmed occurrences of these species, there is a probability that some protected species or SCC may occur in areas unaffected by disturbances. However, the likelihood remains low.

The environmental impact assessment in terms of habitat and floral components is expected to be very low, with or without mitigation measures. Thus, the commencement of the proposed development is not expected to influence the environment drastically negatively at the site. However, these influences will be permanent, and care must be taken to minimise the long-term effect of the development on the environment.

1. Introduction:

1.1. Project background:

The proposed pump station and pipeline development is located on Farm Kgotsong No 1195, portion 0, and Farm Botharnia No.9 portion 0, Bothaville.
The proposed site is located within a 2.5km radius of Bothaville, approximately 1.43.km, as the crow flies, North East of Bothaville, North of the R727.
Surrounding broadscale vegetation is largely influenced by urban development, informal agricultural practices or remains natural. The study area is part of a narrow semi-natural habitat corridor which is fragmented by anthropogenic movements and development. Within the study area, the land has previously been utilised in agricultural land use or left natural with free-roaming domesticated animals.

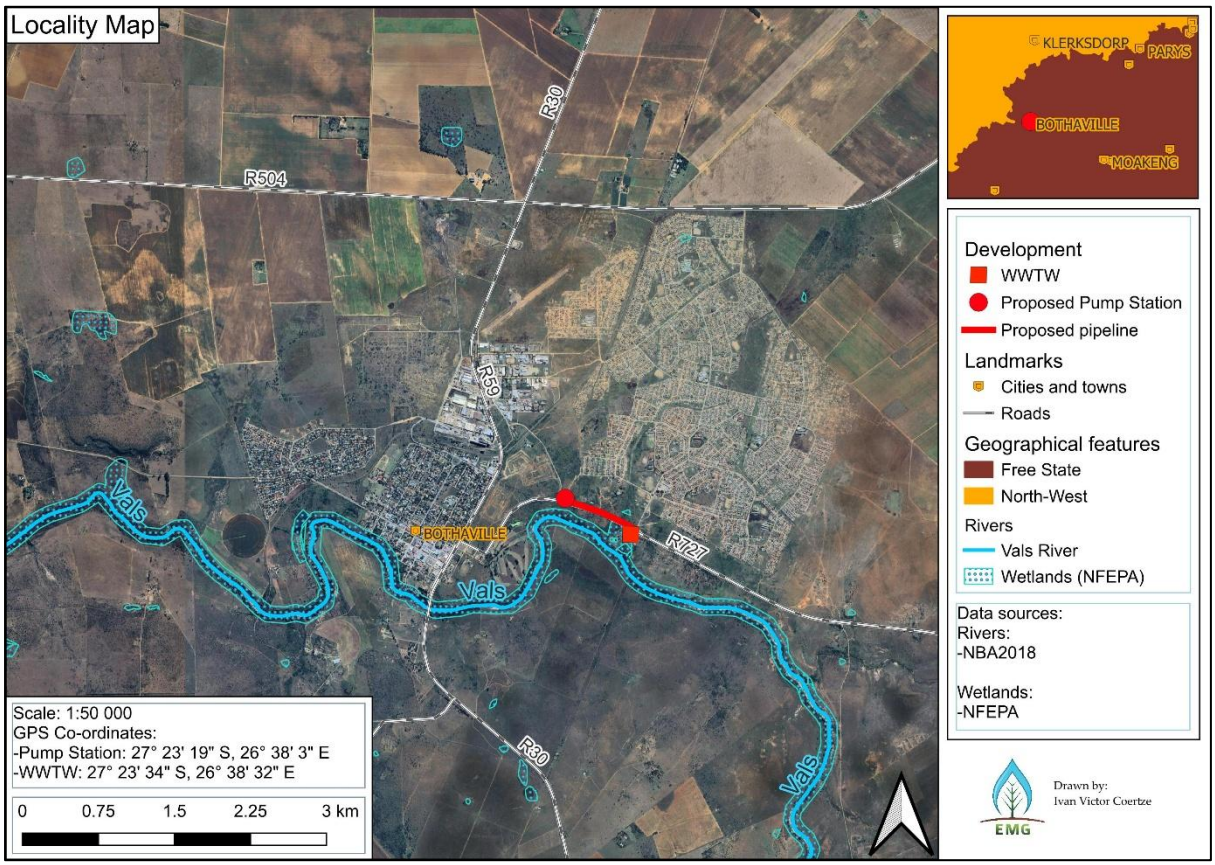

Figure 1: Locality map of the proposed pump station and pipeline development.

1.2. Terms of reference:

In accordance with the National Environmental Management Act (Act 107 of 1998, as amended) (NEMA) Environmental Impact Assessment (EIA) Regulations of 2017, a site sensitivity verification has been undertaken to confirm the current land use and environmental sensitivity of the proposed project area as identified by the National Web-Based Environmental Screening Tool (Screening Tool).
Procedures and minimum criteria to be met in the site verification have been reported on in accordance with the Procedures for the Assessment and minimum criteria for

reporting on identified environmental themes in terms of sections 24(5)(a) and (h) and 44 of the National Environmental Management Act, 1998, When applying for Environmental Authorisation (GNR 320, 20 March 2020).

1.3. Historical land use:

Historically, the proposed development has been utilised for agricultural land uses, specifically that of cultivation and other topsoil disturbances (Figure 2). Figure 2 contains aerial photographs of the approximate study area (Size on image may vary) dating to 1972 (a), where land cultivation can be seen as topsoil disturbance and 1988 (b) where the cultivation can be seen along with informal road developments.

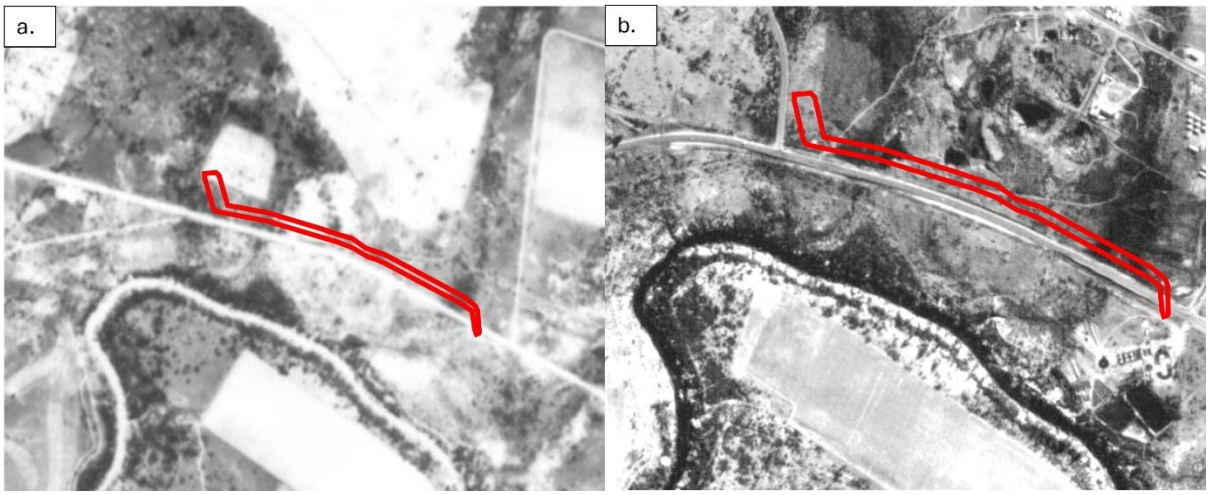

Figure 2: Location and approximate size of study area throughout history. a). aerial view in 1972. b). aerial view in 1988.

1.4. DFFE screening tool identified theme sensitivities:

As per the DFFE screening tool, the proposed development area will affect an area with a low sensitivity for the Terrestrial Biodiversity theme.
According to the Free State province Biodiversity Plan's Terrestrial critical biodiversity areas (Collins, 2018), the proposed development site is located largely in areas classified as Other. According to the Vegetation Map of South Africa, Lesotho and Swaziland (SANBI, 2006-2008; SANBI&DFFE, 2022), the proposed development is located in the Highveld Alluvial Vegetation vegetation type which is of Least concern.

1.5. Procedures according to the DFFE screening tool outcomes:

A low sensitivity for the Terrestrial Biodiversity Theme was identified in the DFFE screening tool. When the site sensitivity identified as low for the Terrestrial Biodiversity theme is found to be of low sensitivity on site, a Terrestrial Biodiversity Compliance statement is required.
For the reasons mentioned above, it is necessary to conduct a Terrestrial Ecology verification assessment and compliance statement to assess the possible environmental impacts generated by developmental activities. Recommendations and

mitigation measures provided in this report should be used to minimise the effects of development.

2. Scope and limitations of the study:

- Perform a site inspection to determine the presence or likely presence or confirmed absence of SCC
- Perform a site sensitivity verification and evaluation for the study area's "*in situ*" environment.
- Identifying and assessing possible environmental impacts the proposed development could generate.

2.1. Assumptions and limitations:

- This report assumes the vegetation type description was unbiased and all relevant botanical/ ecological related information was accurately described.
- Not all plants have the same growth and/or flowering period; thus, it is likely that the survey could have occurred outside of a specific species' growth and/or flowering period.
- Some geophytic and succulent plants have specialised in mimicking their surrounding habitat. Thus, some of these plants might have been overlooked due to their cryptic nature.
- Species of conservation concern (SCC) are generally uncommon and/or localised. Thus, locating such species can be challenging when attempts to locate such species occur outside the SCC's flowering season.
- Some aspects may have been overlooked because ecology is vast, dynamic, and highly complex. However, most floral communities have been accurately assessed and considered. Therefore, the information within this report is sufficient to allow informed decision-making.
- Most plant species in central northern South Africa experience summer rainfall, which allows for spring growth periods and summer-spring flowering season. The growing and flowering periods allow for the presence of identifiable characters. The presence of identifiable characters increases the accuracy and possibility of species identification, making vegetation community interpretation more thorough. Thus, spring is an optimal season in which to perform vegetation surveying for this study region.
- The vegetation surveying took place on the 12th of February 2025, which is within the optimal season for vegetation surveying. The surveying duration was 2 hours (11:00-13:00), at a time in which most flowers are open.

3. Methodology:

3.1. Verification of the *in situ* environment:

A desktop study was performed prior to field surveys with emphasis on the following:

- Vegetation type verification
- Possible species occurrence verification
- Current land use through satellite imagery

Site verification surveys were conducted in February 2025, focusing on ground truthing of information acquired during the desktop study. The survey was performed by means of transects traversed on foot. Attention was given to the current state of the environment regarding grazing impacts, anthropogenic disturbances, erosion and the presence of alien or invasive species.

3.2. Sources used for additional information:

Broader habitat:

- Satellite imagery (QGIS) was used in order to view the broader area on a landscape level.

Vegetation:

- The South African Red List of Plants (Raimondo et al. 2009).
- Vegetation types (Mucina and Rutherford, 2006; SANBI, 2006-2018).
- The INaturalist website was also consulted to obtain probable species presence identified by the general public.
- Field guides used for species identification (van Wyk and Malan, 1998; Botha, 2001; van Rooyen et al., 2001; Bromilow, 2010; van Wyk and van Wyk, 2013; van Oudtshoorn, 2014; Manning, 2019).

4. Findings:

4.1. The physical environment:

The proposed development is located within a 2.5 km radius of Bothaville, in the Free State Province. Overall, the study area is expected to be larger than the proposed development area. The study area is less than 2.1 ha, with the proposed development expected to not exceed this area.

Most of the study area is in a natural state, but topsoil disturbances, low impact agricultural use and daily anthropogenic movements were visible. It was observed that the study area is used as a natural rangeland for free-roaming cattle. The study area's landscape slopes gently, in the pump station area, ascending from the southern parts of the study area to the northern parts of the most corner of the study area. Along the pipeline, the altitude ascends from either end towards the middle of the pipeline. Altitudes of the study area range from 1259 m in the western parts of the pipeline below the pump station to 1261 m in the northern parts of the pump station to 1265 m in the middle of the pipeline.

Physical landscape features of the Highveld Alluvial Vegetation are typically flat. Found at altitudes of 1 000 to 1 500 m a.m.s.l.

The description of the physical environment observed on site agree with that of the vegetation type of Mucina and Rutherford (2006) in which the study area is located (SANBI, 2006-2018).

4.2. Vegetation type and bioregional areas:

The proposed development is located in the Highveld Alluvial Vegetation vegetation type and entirely within the remaining extent thereof (Dayaram, 2018; Mucina and Rutherford, 2006).

The Highveld Alluvial Vegetation vegetation type is characteristically a riparian thicket dominated by Vachellia karroo, with seasonally flooded grasslands and disturbed herblands. Other dominant taxa include *Salix mucronata* subsp *mucronata, Salix mucronata* subsp *woodie and Ziziphus mucronata. Gymnosporia buxifolia, Searsia pyroides, Asparagus laricinus, Asparagus suaveolens, Lycium hirsutum, Setaria verticillata, Phragmaties australis, Gomphocarpus fruticosus, Agrostis lachnantha, Andropogon eucomus, Chloris virgata, Cynodon dactylon, Eragrostis plana, Hemarthria altissima, Imperata cylindrica, Ischaemum fasciculatum, Miscanthus junceus, Paspalum distichum* and *Persicaria lapathifolia* (Mucina and Rutherford, 2006).

The vegetation observed within the study area is largely natural with grazing impacts visible thereon. Furthermore, large sections of the proposed development area have undergone vegetation removal with topsoil disturbance. Additionally, other activities relating to land use can be seen within the study area. This includes free-roam grazing, anthropogenic movements and vehicle tracks leading to compaction as well as alien species emergence, with few signs of bush encroachment.

The findings of this report agree with the low sensitivity of the terrestrial biodiversity theme in the DFFE screening tool.

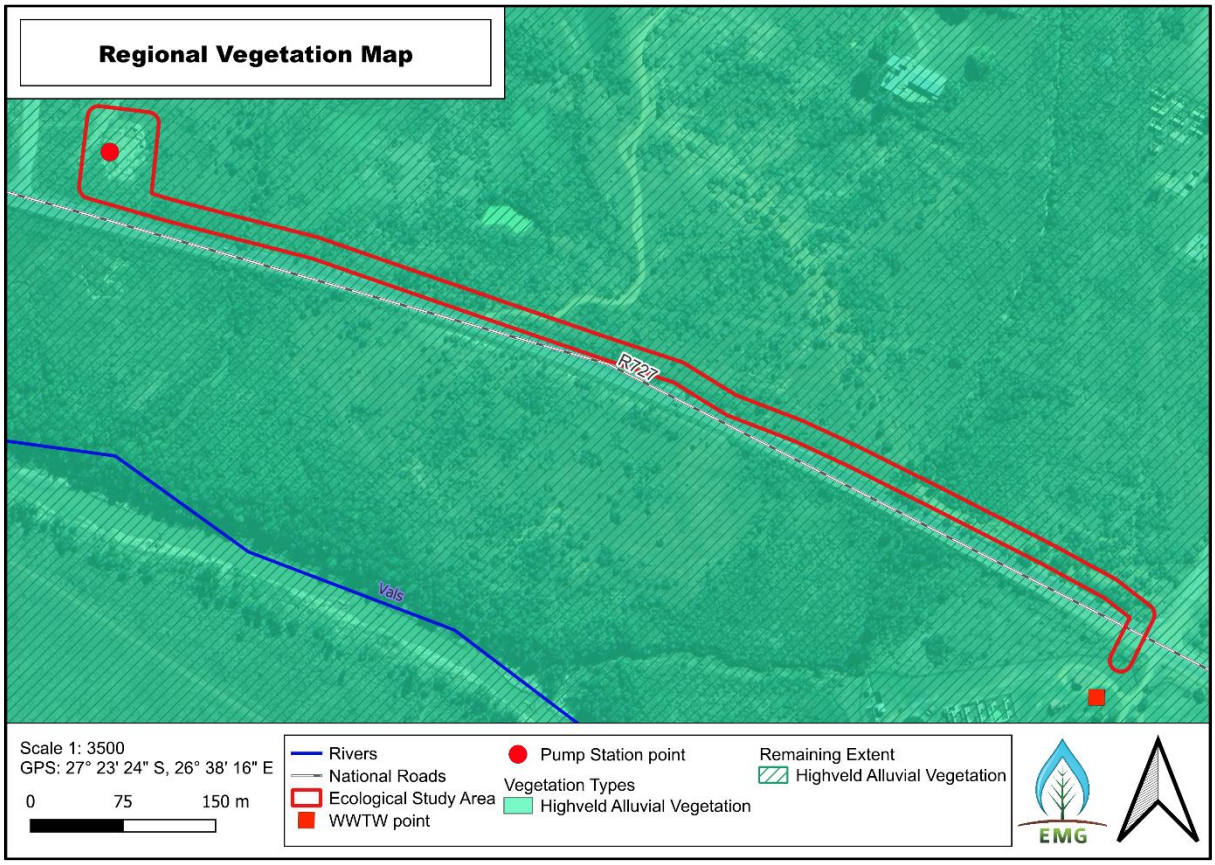

Figure 3: The regional vegetation type and remaining extent in relation to the study area.

The Highveld Alluvial Vegetation vegetation type has a conservation status of Least Concern (LC) according to the Red List of Terrestrial Ecosystems of South Africa November 2022 (SANBI & DEFF, 2022). Thus, the findings of this report agree with that of the DFFE screening tool report.

The study area is located in areas classified under the Free State biodiversity plan as Other Natural Areas (OSA's) (Collins, 2019).

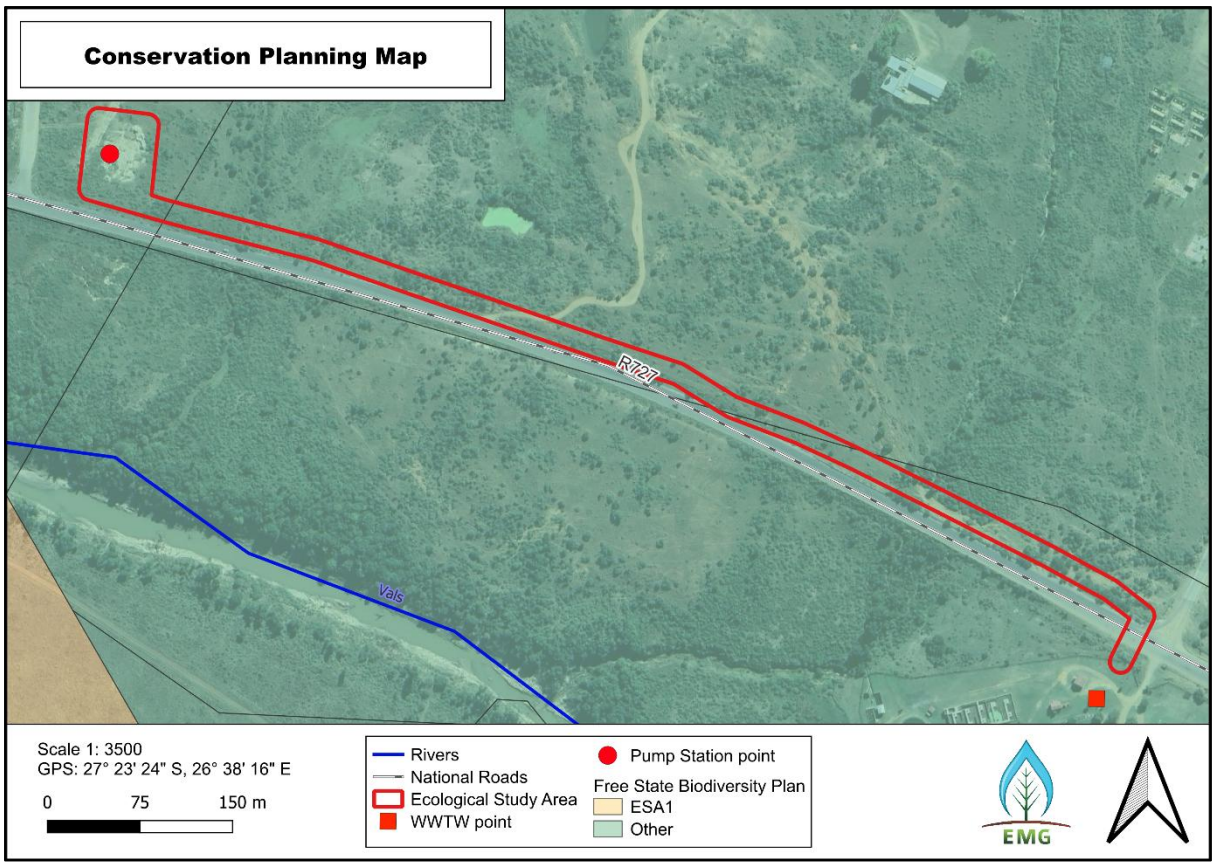

Figure 4: A map of the study area in relation to the map of the Free State province's biodiversity plan map.

4.3. Vegetation features:

The study site's physical environment more or less agrees with the physical environment description of the Highveld Alluvial Vegetation (Mucina and Rutherford). Similarities between the Highveld Alluvial Vegetation vegetation type and the study area's vegetation in terms of vegetation structure and composition can be seen (Mucina and Rutherford, 2006). However, it can be seen that natural vegetation remaining within the study area has largely been influenced by historical topsoil disturbances and ongoing current anthropogenic activities.

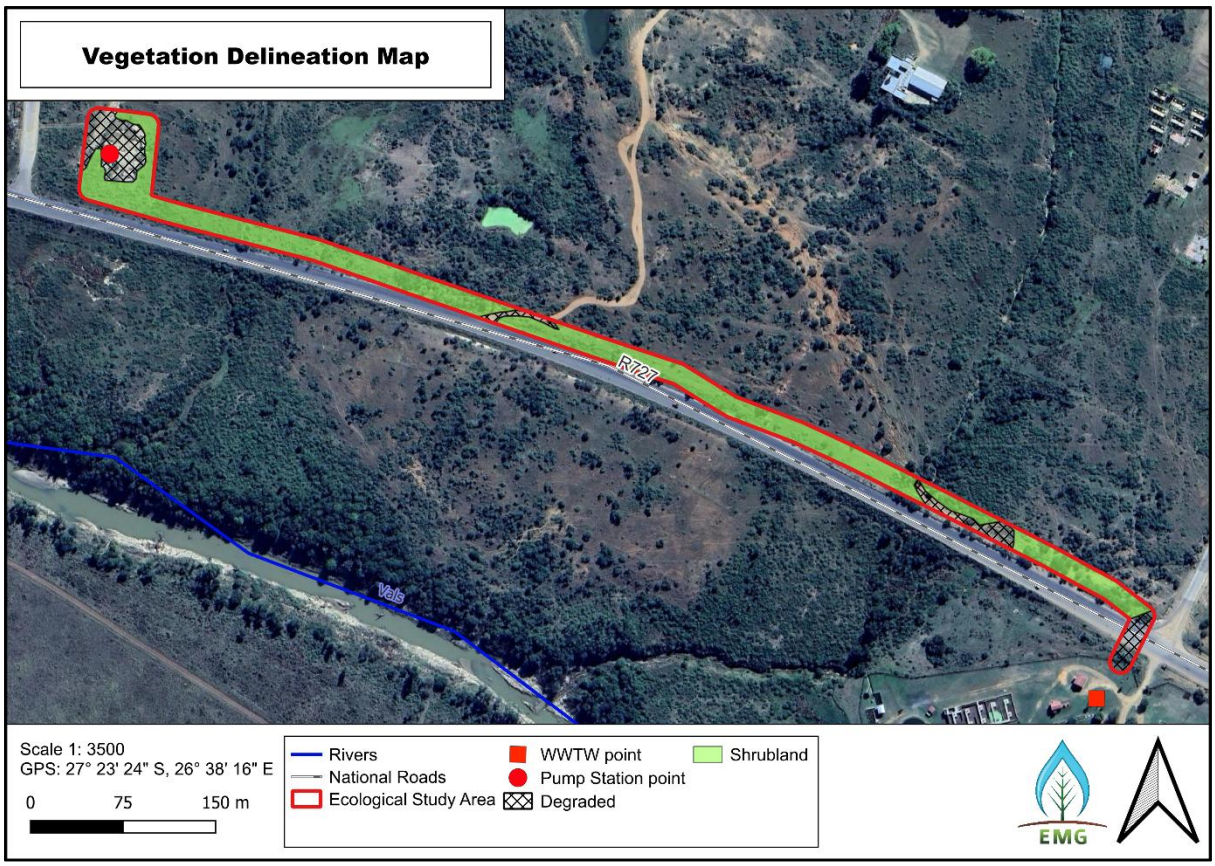

Figure 5: A study area map showing the area which remains largely natural with few current ecological negative impacts due to informal agricultural practices and anthropogenic movements. The remaining area is transformed in the disturbed area due to topsoil disturbances, informal and formal infrastructure development.

<u>Shrubland</u>

This vegetation unit is found primarily along the pipeline route, except for three areas classified as degraded, as well as in the southern and eastern parts of the proposed pump station area.

Vegetation coverage is moderate to high, with shrubs and grasses dominating.

The tree layer is fairly developed in some areas, whilst near absent in others. The tree layer primarily consists of *Vachellia karroo*, with *Ziziphus mucronata* and *Diospyros lycoides* being the other dominant tree species.

The shrub layer is well developed, with *Asparagus laricinus, Ziziphus mucronata, Vachellia hebeclada* and *Ouret leucura* dominating.

The grass layer was well developed in most areas, with bare ground being observed rarely in this vegetation unit. Dominant grasses include *Paspalum dilatatum, Cynodon dactylon, Eragrostis lehmanniana, Pogonarthria squarrosa, Aristida congesta, Themeda Triandra, Hyparrhenia hirta* and *Eragrostis superba*.

The forb layer is very well developed, with a high species diversity. Dominant forbs include *Hilliardiella elaeagnoides, Ipomoea bathycolpos, Hibiscus trionum, Nidorella resedifolia, Crabbea acaulis, Barleria macrostegia, Gomphrena celosioides, Hermannia coccocarpa* and *Indigofera heterophylla*. The following forbs were observed in the study area: *Nidorella podocephala, Berkheya radula, Felicia muricata,*

Haplocarpha scaposa Commelina livingstonii, Coccinia sessilifolia, hibiscus calyphyllus, plantago major, Stachys sp., ledebouria luteola, Indigofera alternans, Monsonia angustifolia, Polygala hottentotta, Cordylostigma virgatum and *Tribulus terrestris*.

One Geophytic species, *Raphionacme hirsuta* was observed within close proximity to the areas affected by topsoil disturbance. Thus, their occurrence in the surrounding undisturbed soil is highly probable. *Raphionacme hirsuta* is known for its small, purple star flowers and very large, tuberous rootstock, making this plant capable of persisting many seasons of dormancy. In my professional opinion, the time and energy it takes to produce such large, efficient storage organs is worth conservative handling when coming across these individuals. Please Note: Their removal does not require a permit in the case of most bulbous species, however, we recommend that a qualified botanist or at the very least a knowledgeable ECO be contacted to perform a walkthrough and rescue of these individuals.

Several alien and invasive species were observed within this vegetation unit. NEM:BA Category 1b listed alien and invasive species observed include: *Xanthium strumarium, Ipomoea indica, Cestrum parqui, Solanum elaeagnifolium* and *Verbena brasiliensis*. Other alien and invasive species which are not listed by NEM:BA include: *Glandularia aristigera, Richardia brasiliensis, Schkuhria pinnata* and *Verbesina encelioides*. Although these AIS were observed on site, the population has yet to be established.
Although the presence of alien and invasive species were noted, the vegetation type describes the presence of alien and invasive species in disturbed herblands.

Despite the ongoing anthropogenic activities, such as foot paths, litter and two-track roads, and other disturbances such as informal cattle grazing, the diversity observed, particularly in the forb layer aligns with and agrees with the Highveld alluvial Vegetation type description.

As such, the ecological functioning of this area is considered good, but likely weakened.

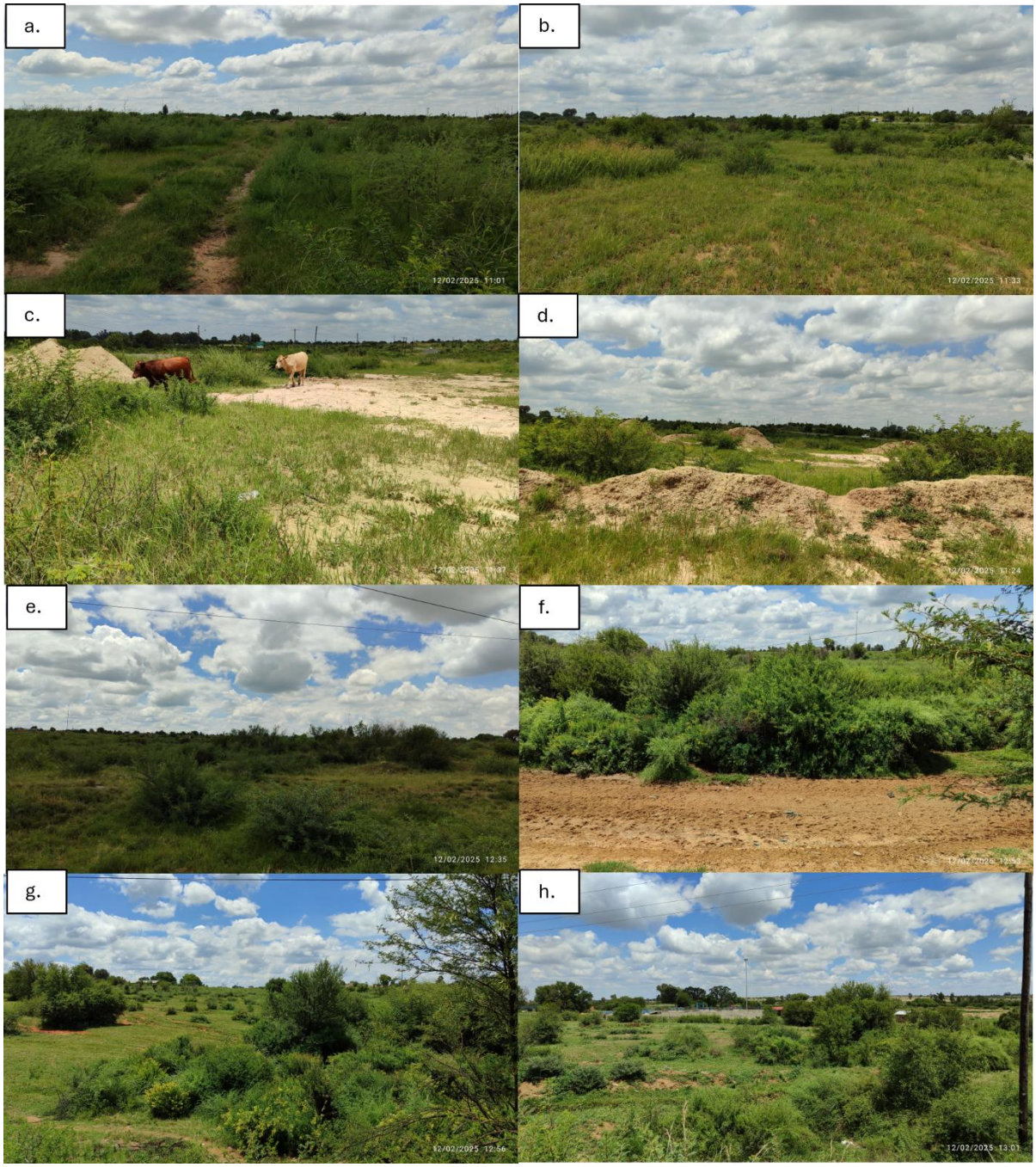

Figure 6: Ground view of the vegetation structure and ecological impacts of Vegetation Unit A. (a). East facing, *27°23'17.9"S 26°38'00.8"E*. (b) East facing, *27°23'19.1"S 26°38'04.3"E*. (c). South westerly facing, *27°23'19.0"S 26°38'03.5"E*. (d) South easterly facing, *27°23'17.7"S 26°38'02.5"E*. (e). North facing,*27°23'22.4"S 26°38'12.3"E.*. (f). North westerly facing, *27°23'28.3"S 26°38'27.2"E.* (g)South facing, *27°23'29.7"S 26°38'29.1"E.* (h). South facing *27°23'30.8"S 26°38'31.3"E*

A comprehensive floral survey was not conducted for this report due to the site's occurrence in a vegetation type of Least Concern and occurrence in areas classified as Other by the Free State Spatial Biodiversity Plan. Some modification of the environment within the study area has been recorded. The environment has been modified through low to intermediate levels of disturbance from agricultural land use practices and topsoil disturbances.

The vegetation observed within the study area has a good floral species richness, is disturbed through anthropogenic movements and activities, historic and current agricultural activities and showed signs (presence of indicators) with alien and invasive species, naturalised alien species as well as with indigenous bush encroachers. Overall, the entire study area has been influenced by anthropogenic activities. Despite this, the majority of the site is in a good ecological condition.

No nationally or provincially protected flora were observed on site. No confirmed or highly likely occurrence of SCC or range-restricted species were recorded for the site. Thus, the conservation importance of the site is considered low. The functional integrity of the site is low, due to the overall small (<5 ha) size of the area and several minor and major current negative ecological impacts. These impacts include but are not limited to: grazing, litter, anthropogenic movements (foot paths), unintentional introduction of alien and invasive species, unintentional introduction of selective grazers (cattle), and topsoil disturbance. Thus, the sites biodiversity importance is low. The proposed area's resilience is expected to be medium due to the nature of species observed on site. Thus, the site ecological importance is low. Minimisation mitigation is acceptable.

5. Impact assessment and recommendations:

The proposed development will influence roughly less than 2.1 ha of a partial natural environment. The proposed development will not affect any nationally or provincially protected flora. Total vegetation clearance is expected to influence less than 2.1 ha which has been influenced by topsoil disturbance and has been utilised as informal agricultural use. Strict monitoring and the effective implementation of all the mentioned mitigation measures will reduce the overall impact on the receiving environment.

Table 1 Impact assessment evaluation for concerned aspects relating to the proposed development.

Concerned aspect	**Impact evaluation pre and post mitigation**		**Mitigation**
Habitat loss	Very low	Very low	• Habitat disturbance and vegetation clearance should be restricted to the authorised area. • Cleared indigenous vegetation should be mulched for use in rehabilitation.

Loss of provincially protected flora	Very Low	Very low	• Cleared alien and invasive vegetation should be burned within a controlled area (such as a metal drum) or removed from site and taken to a registered waste facility. • All barren/unvegetated spaces cleared during construction, which also includes the creation of topsoil stockpiles should be kept clear of vegetation. • Topsoil should not be accidentally mixed with waste or other contaminants. • An alien and invasive management plan should be drafted and implemented. • Alien and invasive species monitoring and eradication must take place quarterly. • Should any SCC be located during construction activities, construction should be halted and a qualified Botanist contacted to perform a search and rescue operation. •
Loss of floral SCC	Very low	Very low	

6. Conclusion:

Although the vegetation on site remains largely natural, the disturbances such as the long term occurrence of topsoil disturbance activities have a marked effect on the vegetation. However, the site is found to be in good ecological functioning and overall good species richness.

The vegetation of the proposed development shares similarities with the Highveld Alluvial Vegetation vegetation type in both composition and structure. Thus the vegetation on site agrees with the vegetation type description (Mucina and Rutherford, 2006). However, this vegetation type's conservation status is Least Concern (LC)

No floral SCC, nationally or provincially protected species observed within the proposed development area. Despite no confirmed occurrences of these species, there is a probability that some protected species or SCC may occur in areas unaffected by disturbances. However, the likelihood remains low.

The environmental impact assessment in terms of habitat and floral components is expected to be very low, with or without mitigation measures. Thus, the commencement of the proposed development is not expected to influence the environment drastically negatively at the site. However, these influences will be permanent, and care must be taken to minimise the long-term effect of the development on the environment.

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Appendix A

This appendix is to provide verifiable evidence of the specialists site inspection in alignment with the Amendment to the protocols for the specialist assessment and minimum report content requirements for Environmental Impacts on Terrestrial Animal and Plant Species in terms of Sections 24(5)(a) and (h) and 44 of the National Environmental Management Act, 1998. (GNR 3717 of 28 July 2023).

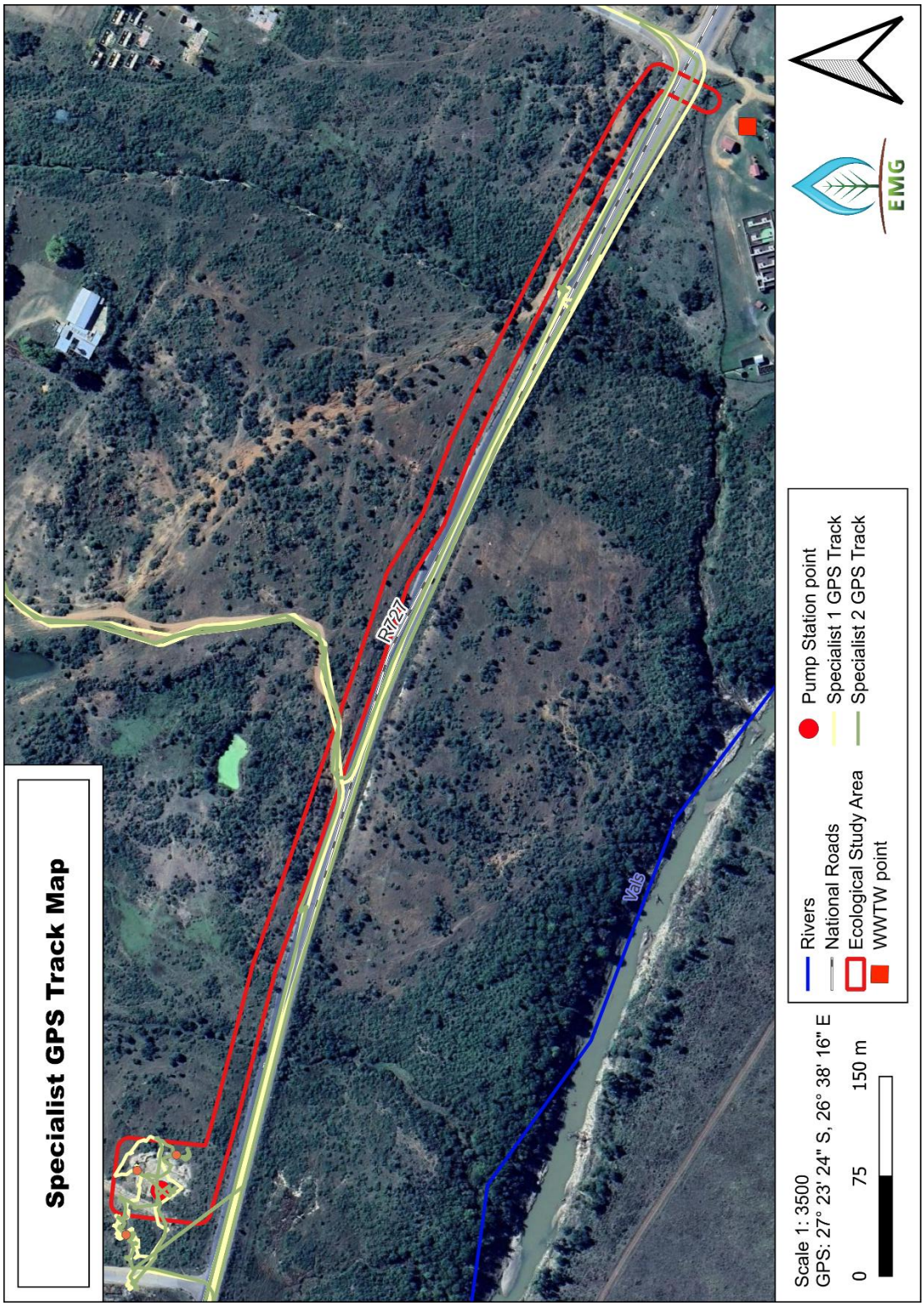

Figure 7: A map showing the specialist's GPS track in relation to the study area.

Appendix B

Family	Species	Indigenous	Ecological status
Acanthaceae	*Barleria macrostegia*	indig	
	Crabbea acaulis	indig; end	
Amaranthaceae	*Alternanthera pungens*	notindig; nat	
	Gomphrena celosioides	notindig; nat	
	Ouret leucura	indig	
Asparagaceae	*Asparagus laricinus*	indig	
	Asparagus suaveolens	indig	
Asteraceae	*Berkheya radula*	indig	
	Cirsium vulgare	notindig; nat; inv	1b
	Erigeron bonariensis	notindig; nat	
	Felicia muricata	indig; end	
	Geigeria aspera	indig; end	
	Haplocarpha scaposa	indig	
	Hilliardiella elaeagnoides	indig	
	Nidorella podocephala	indig	
	Nidorella resedifolia	indig	
	Schkuhria pinnata	notindig; nat	
	Verbesina encelioides	notindig; nat	
	Xanthium strumarium	notindig; nat; inv	1b
Commelinaceae	*Commelina livingstonii*	indig	
Convolvulaceae	*Ipomoea bathycolpos*	indig; end	
	Ipomoea indica	notindig; nat; inv	1b
Cucurbitaceae	*Coccinia sessilifolia*	indig; end	
Ebenaceae	*Diospyros lycioides*	indig; end	
	Euclea crispa	indig	
Fabaceae	*Acacia hebeclada*	indig	
	Acacia karroo	indig	
	Indigofera alternans	indig	
	Indigofera heterophylla	indig; end	
Geraniaceae	*Monsonia angustifolia*	indig	
Hyacinthaceae	*Ledebouria luteola*	indig; end	
Lamiaceae	*Stachys* sp.	indig	
Malvaceae	*Hermannia coccocarpa*	indig; end	
	Hibiscus calyphyllus	indig	
	Hibiscus trionum	notindig; nat	
Plantaginaceae	*Plantago major*	notindig; nat	
Poaceae	*Aristida congesta*	indig	
	Cynodon dactylon	indig	
	Eragrostis lehmanniana	indig; end	
	Eragrostis superba	indig	
	Hyparrhenia hirta	indig	
	Pogonarthria squarrosa	indig	
	Themeda triandra	indig	

Polygalaceae	*Polygala hottentotta*	indig	
Rhamnaceae	*Ziziphus mucronata*	indig	
	Ziziphus zeyheriana	indig	
Rubiaceae	*Cordylostigma virgatum*	indig	
	Richardia brasiliensis	notindig; nat	
Scrophulariaceae	*Selago densiflora*	indig; end	
Solanaceae	*Cestrum parqui*	notindig; nat; inv	1b
	Solanum elaeagnifolium	notindig; nat; inv	1b
Verbenaceae	*Glandularia aristigera*	notindig; nat; inv	
	Verbena brasiliensis	notindig; nat; inv	1b
Zygophyllaceae	*Tribulus terrestris*	indig	