DRAFT BASIC ASSESSMENT

The proposed construction of a new abstraction works and the possible upgrading of certain infrastructure associated with the existing abstraction works at the Sand River, Senekal, Free State

Applicant: Setsoto Local Municipality
MDA Ref No: 41032
DESTEA Ref No:
NEAS Ref No:
Date: June 2022

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economic, small business development,
tourism and environmental affairs
FREE STATE PROVINCE

(For official use only)

File Reference Number:	
Application Number:	
Date Received:	

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

Kindly note that:

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

14. Two (2) colour hard copies and one (1) electronic copy of the report must be submitted to the competent authority.
15. Shape files (.shp) for maps must be included in the electronic copy of the report submitted to the competent authority.

SECTION A: ACTIVITY INFORMATION

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

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

1. PROJECT DESCRIPTION

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

The proposed project entails the construction of a new abstraction works and the upgrading of certain infrastructure associated with the existing abstraction works at the Sand River, Senekal.

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

Listed activity as described in GN 327,325 and 324	Description of project activity
Example: ***GN 327 Item xx xx): The construction of a bridge where such construction occurs within a watercourse or within 32 metres of a watercourse, measured from the edge of a watercourse, excluding where such construction will occur behind the development setback line.***	***A bridge measuring 5 m in height and 10m in length, no wider than 8 meters will be built over the Orange river***
Regulation 983, Listing Notice 1 (BAR), Activity 19: The infilling or depositing of any material of more than 10 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 10 cubic metres from (i) a watercourse; but excluding where such infilling, depositing, dredging, excavation, removal or moving— (a) will occur behind a development setback;	The proposed project entails the construction of a new abstraction works and the upgrading of certain infrastructure associated with the existing abstraction works at the Sand River, Senekal. As part of the mentioned activities, sand, soil or rock within the watercourse, of more than 10 cubic metres may be moved / removed / excavated.

(b) is for maintenance purposes undertaken in accordance with a maintenance management plan; (c) falls within the ambit of activity 21 in this Notice, in which case that activity applies; (d) occurs within existing ports or harbours that will not increase the development footprint of the port or harbour; or (e) where such development is related to the development of a port or harbour, in which case activity 26 in Listing Notice 2 of 2014 applies. "watercourse" means (a) a river or spring; (b) a natural channel in which water flows regularly or intermittently; (c) a wetland, pan, lake or dam into which, or from which, water flows; and (d) any collection of water which the Minister may, by notice in the Gazette, declare to be a watercourse as defined in the National Water Act, 1998 (Act No. 36 of 1998); and a reference to a watercourse includes, where relevant, its bed and banks	
Regulation 983, Listing Notice 1 (BAR), Activity 27: The clearance of an area of 1 hectares or more, but less than 20 hectares of indigenous vegetation, except where such clearance of indigenous vegetation is required for – (i) The undertaking of a linear	The clearance of vegetation will occur as part of the proposed project.

activity; or (ii) Maintenance purposes undertaken in accordance with a maintenance management plan.	

2. FEASIBLE AND REASONABLE ALTERNATIVES

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

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

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

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

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

a) Site alternatives

Alternative 1 (preferred alternative)		
Description	Lat (DDMMSS)	Long (DDMMSS)
The proposed project entails the construction of a new abstraction works and the upgrading of certain infrastructure associated with the existing abstraction works at the Sand River,	28°14'29.53"S 28°14'28.06"S 28°14'29.12"S 28°14'30.01"S	27°39'21.26"E 27°39'23.68"E 27°39'25.34"E 27°39'25.32"E

Senekal. The locality, layout and technology of the proposed infrastructure was considered in conjunction with the locality, layout and operational status of the existing infrastructure associated with the Senekal Bulk Water Supply Scheme.	28°14'32.34"S 28°14'31.87"S	27°39'24.34"E 27°39'21.40"E
Alternative 2		
Description	Lat (DDMMSS)	Long (DDMMSS)
N/A		
Alternative 3		
Description	Lat (DDMMSS)	Long (DDMMSS)
N/A		

In the case of linear activities:

NOT APPLICABLE

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

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

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

b) Lay-out alternatives

Alternative 1 (preferred alternative)		
Description	Lat (DDMMSS)	Long (DDMMSS)
The proposed project entails the construction of a new abstraction works and the upgrading of certain infrastructure associated with the	28°14'29.53"S 28°14'28.06"S 28°14'29.12"S	27°39'21.26"E 27°39'23.68"E 27°39'25.34"E

existing abstraction works at the Sand River, Senekal. The locality, layout and technology of the proposed infrastructure was considered in conjunction with the locality, layout and operational status of the existing infrastructure associated with the Senekal Bulk Water Supply Scheme.	28°14'30.01"S 28°14'32.34"S 28°14'31.87"S	27°39'25.32"E 27°39'24.34"E 27°39'21.40"E
Alternative 2		
Description	Lat (DDMMSS)	Long (DDMMSS)
As an alternative, the construction of a new abstraction works at a different locality at the Sand River was considered. However, this option is costly and unnecessary as the existing infrastructure will minimise the costs involved. In addition, the area was already disturbed by the construction of the existing infrastructure. Therefore, this option is not seen as a feasible and / or reasonable alternative and will not be discussed further in this report.		
Alternative 3		
Description	Lat (DDMMSS)	Long (DDMMSS)
N/A		

c) Technology alternatives

Alternative 1 (preferred alternative)
The proposed project entails the construction of a new abstraction works and the upgrading of certain infrastructure associated with the existing abstraction works at the Sand River, Senekal. The locality, layout and technology of the proposed infrastructure was considered in conjunction with the locality, layout and operational status of the existing infrastructure associated with the Senekal Bulk Water Supply Scheme.
Alternative 2
N/A
Alternative 3
N/A

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

Alternative 1 (preferred alternative)		
The proposed project entails the construction of a new abstraction works and the upgrading of	28°14'29.53"S 28°14'28.06"S	27°39'21.26"E 27°39'23.68"E

certain infrastructure associated with the existing abstraction works at the Sand River, Senekal. The locality, layout and technology of the proposed infrastructure was considered in conjunction with the locality, layout and operational status of the existing infrastructure associated with the Senekal Bulk Water Supply Scheme.	28°14'29.12"S 28°14'30.01"S 28°14'32.34"S 28°14'31.87"S	27°39'25.34"E 27°39'25.32"E 27°39'24.34"E 27°39'21.40"E
Alternative 2		
As an alternative, the construction of a new abstraction works with a different design at a different locality at the Sand River was considered. However, this option is costly and unnecessary as the use of the existing infrastructure will minimise the costs involved. In addition, the area was already disturbed by the construction of the existing infrastructure. Therefore, this option is not seen as a feasible and / or reasonable alternative and will not be discussed further in this report.		
Alternative 3		
N/A		

e) No-go alternative

Not to construct any new infrastructure associated with the abstraction works. This will reduce the functionality and lead to malfunctioning of the Senekal Bulk Water Supply System. Therefore, the no-go option is not seen as a feasible and / or reasonable alternative.

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

3. PHYSICAL SIZE OF THE ACTIVITY

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

Alternative:	**Size of the activity:**
Alternative A1[1] (preferred activity alternative)	12 000 m^2
Alternative A2 (if any)	N/A

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

Alternative A3 (if any)	N/A

or, for linear activities:

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

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

Alternative:	**Size of the site/servitude:**
Alternative A1 (preferred activity alternative)	2 2500 000 m^2
Alternative A2 (if any)	N/A
Alternative A3 (if any)	N/A

4. SITE ACCESS

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

Describe the type of access road planned:

The existing dirt road will be used to gain access to the site. The said road will be maintained by the applicant / contractor during the proposed activities.

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

5. LOCALITY MAP

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

- an accurate indication of the project site position as well as the positions of the alternative sites, if any;
- indication of all the alternatives identified;
- closest town(s;)
- road access from all major roads in the area;
- road names or numbers of all major roads as well as the roads that provide access to the site(s);

- all roads within a 1km radius of the site or alternative sites; and
- a north arrow;
- a legend; and
- locality GPS co-ordinates (Indicate the position of the activity using the latitude and longitude of the centre point of the site for each alternative site. The co-ordinates should be in degrees and decimal minutes. The minutes should have at least three decimals to ensure adequate accuracy. The projection that must be used in all cases is the WGS84 spheroid in a national or local projection.

6. LAYOUT/ROUTE PLAN

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

The site or route plans must indicate the following:

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

7. SENSITIVITY MAP

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

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

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

8. SITE PHOTOGRAPHS

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

9. FACILITY ILLUSTRATION

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

10. ACTIVITY MOTIVATION

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

1. Is the activity permitted in terms of the property's existing land use rights?	YES		
The proposed project entails the construction of abstraction works and / or upgrading of existing infrastructure at the existing abstraction works at the Sand River, Senekal.			
2. Will the activity be in line with the following?			
(a) Provincial Spatial Development Framework (PSDF)	YES		
The proposed project entails the construction of abstraction works and / or upgrading of existing infrastructure at the existing abstraction works at the Sand River, Senekal. The said activities are required for the optimal operation of the Bulk Water Supply System in Senekal.			
(b) Urban edge / Edge of Built environment for the area	YES		
The proposed project entails the construction of abstraction works and / or upgrading of existing infrastructure at the existing abstraction works at the Sand River, Senekal.			
(c) Integrated Development Plan (IDP) and Spatial Development Framework (SDF) of the Local Municipality (e.g. would the approval of this application compromise the integrity of the existing approved and credible municipal IDP and SDF?).	YES		
The applicant of the proposed project is the Local Municipality itself. Therefore, the proposed project will be in line with the Municipal Plans for the said area.			
(d) Approved Structure Plan of the Municipality	YES		
The applicant of the proposed project is the Local Municipality itself. Therefore, the proposed project will be in line with the Municipal Plans for the said area.			

(e) An Environmental Management Framework (EMF) adopted by the Department (e.g.i Would the approval of this application compromise the integrity of the existing environmental management priorities for the area and if so, can it be justified in terms of sustainability considerations?)	YES		
The applicant of the proposed project is the Local Municipality itself. Therefore, the proposed project will follow the integrity of the existing environmental management priorities for the area.			
(f) Any other Plans (e.g. Guide Plan)			N/A
N/A			
3. Is the land use (associated with the activity being applied for) considered within the timeframe intended by the existing approved SDF agreed to by the relevant environmental authority (i.e. is the proposed development in line with the projects and programmes identified as priorities within the credible IDP)?	YES		
The proposed project is in line with the projects and programmes identified as priorities by the Local Municipality.			
4. Does the community/area need the activity and the associated land use concerned (is it a societal priority)? (This refers to the strategic as well as local level (e.g. development is a national priority, but within a specific local context it could be inappropriate.)	YES		
The proposed project is essential for the proper operation of the Bulk Water Supply System in Senekal. The abstraction works should operate optimally as it will form part of the infrastructure that is used to provide Senekal with potable water.			
5. Are the necessary services with adequate capacity currently available (at the time of application), or must additional capacity be created to cater for the development? (Confirmation by the relevant Municipality in this regard must be attached to the final Basic Assessment Report as Appendix I.)	YES		
Adequate services are in place. Note that the applicant of the proposed project is the local municipality itself; therefore, it is believed that no written confirmation is required from the municipality regarding the above.			

6. Is this development provided for in the infrastructure planning of the municipality, and if not what will the implication be on the infrastructure planning of the municipality (priority and placement of services and opportunity costs)? (Comment by the relevant Municipality in this regard must be attached to the final Basic Assessment Report as Appendix I.)	YES		
The applicant is the local municipality itself.			
7. Is this project part of a national programme to address an issue of national concern or importance?	YES		
The project forms part of the Bulk Water Supply Scheme for the town of Senekal			
8. Do location factors favour this land use (associated with the activity applied for) at this place? (This relates to the contextualisation of the proposed land use on this site within its broader context.)	YES		
The site identified for the proposed activities favour the current land use, due to the following: The existing abstraction works is located in the area A portion of the site (on the Remainder of the farm Zyfer Fontein 246) falls within a servitude registered for Water Supply Services.			
9. Is the development the best practicable environmental option for this land/site?	YES		
The applicable engineers and specialists examined the site and concluded that the site is suitable and indeed the best environmental option.			
10. Will the benefits of the proposed land use/development outweigh the negative impacts of it?	YES		
Negative: • Vegetation loss; • Possible erosion; • Possible water, soil and groundwater pollution. These can be mitigated by implementing the mitigation measures in the EMPr, as well as good practices. **Positive:** • Employment opportunities; • Removal of various alien vegetation species; • Optimal operation of the abstraction works, and therefore the availability of sufficient volume of potable water in Senekal Thus, the positive impacts outweigh the negative impacts.			

11. Will the proposed land use/development set a precedent for similar activities in the area (local municipality)?	YES		
It is suggested that future, similar projects will also: Examine the construction and upgrading of existing infrastructure on areas disturbed previously / close to areas that were disturbed by previous activities. Re-use of removed soil for rehabilitation purposes.			
12. Will any person's rights be negatively affected by the proposed activity/ies?	YES		
Noise levels may be high during the construction phase. The construction phase will also lead to the formation of nuisance dust. However, this will be limited via dust suppression activities (when required). In addition, construction activities will be limited to normal working hours, where possible. Noise levels will have to comply with the requirements as set out in the OSH Act.			
13. Will the proposed activity/ies compromise the "urban edge" as defined by the local municipality?	YES		
The proposed project will not have an impact on the urban edge as defined by the Local Municipality.			
14. Will the proposed activity/ies contribute to any of the 17 Strategic Integrated Projects (SIPS)?	YES		
SIP 18: Water and sanitation infrastructure. The proposed project entails construction of abstraction works as well as the upgrading of certain facilities associated with the existing abstraction works at the Sand River, Senekal. This will enable the Senekal Bulk Water Supply Scheme to operate sufficiently.			
15. What will the benefits be to society in general and to the local communities?	Please explain		
• Employment opportunities • Availability of potable water			
16. Any other need and desirability considerations related to the proposed activity?	Please explain		
N/A			
17. How does the project fit into the National Development Plan for 2030?	Please explain		
N/A			

18. Please describe how the general objectives of Integrated Environmental Management as set out in section 23 of NEMA have been taken into account.

Section 23 of NEMA (Act 107, 27 November 1998) reads as follows:
'23. (1) The purpose of this Chapter is to promote the application of appropriate environmental management tools in order to ensure the integrated environmental management of activities,
(2) The general objective of integrated environmental management is to -
(a) promote the integration of the principles of environmental management set out in section 2 into the making of all decisions which may have a significant effect on the environment:
(b) identify, predict and evaluate the actual and potential impact on the environment, socio-economic conditions and cultural heritage, the risks and consequences and alternatives and options for mitigation of activities, with a view to minimizing negative impacts, maximizing benefits and promoting compliance with the principles of environmental management set out in section 2;
(c) ensure that the effects of activities on the environment receive adequate consideration before actions are taken in connection with them;
(d) ensure adequate and appropriate opportunity for public participation in decisions that may affect the environment;
(e) ensure the consideration of environmental attributes in management and decision-making which may have a significant effect on the environment; and
(f) identify and employ the modes of environmental management best suited to ensuring that a particular activity is pursued in accordance with the principles of environmental management set out in section 2.

(3) The Director-General must coordinate the activities of organs of state referred to in section 24(1) and assist them in giving effect to the objectives of this section and such assistance may include training, the publication of manuals and guidelines and the co-ordination of procedures.'
With the above in mind, the following objectives were taken into consideration:

1. An application for environmental authorisation was submitted to the Department.
2. Integration of various principles of environmental management were implemented in oirder to make decisions regarding the significant effect of the proposed project on the environment
3. Identified, predicted and evaluated the actual potential impact of the proposed project on the environment, the socio-economic conditions and heritage, as well as the consequences and alternatives and options for

mitigation of activities. This was done to minimize the possible negative impacts on the environment and maximizing benefits to mankind.

4. Taken the effects of activities on the environment into consideration before actions are to be taken in connection with them.
5. A public participation process was followed.
6. Considered the environmental attributes in management and decision-making with reference to the environment.
7. Mitigation and management activities best suited to ensuring that a particular activity is pursued in accordance with the principles of environmental management were investigated.
8. The report follows the laws to identify, predict and evaluate the actual and potential impacts associated with the development.
9. Specialists investigated the site to determine baseline and to predict the impacts associated with the proposed project. The preferred alternative has been identified as the one that will have the least negative impact on the environment, as sensitive areas will be avoided as far as possible. In addition, already disturbed areas will be utilized as far as possible.
10. A public participation process was followed. Consideration of the 2014 EIA Regulations has been applied in this regards.
11. An EMPr is included, with mitigation measures that should be implemented during the planning, construction, operation and possible decommissioning of the proposed project. These mitigation measures are in line with the environmental requirements and Best Practise Principles.
12. Relevant guidelines and procedures were used to produce this document. Therefore, relevant information is reflected, for sufficient co-governance to be implemented.
13. The proposed project provides for the needs of the applicant while ensure compliance with environmental management principles.

19. Please describe how the principles of environmental management as set out in section 2 of NEMA have been taken into account.

Section 2 of NEMA (Act 107, 27 November 1998) reads as follows:
(1) The principles set out in this section apply throughout the Republic to the actions of all organs of state that may significantly affect the environment and—
(a) shall apply alongside all other appropriate and relevant considerations, including the State's responsibility to respect, protect, promote and fulfil the social and economic rights in Chapter 2 of the Constitution and in particular the basic needs of categories of persons disadvantaged by unfair discrimination;
(b) serve as the general framework within which environmental management and implementation plans must be formulated:

(c) serve as guidelines by reference to which any organ of state must exercise any function when taking any decision in terms of this Act or any statutory provision concerning the protection of the environment;

(d) serve as principles by reference to which a conciliator appointed under this Act must make recommendations; and

(e) guide the interpretation, administration and implementation of this Act, and any other law concerned with the protection or management of the environment.

(2) Environmental management must place people and their needs at the forefront of its concern, and serve their physical, psychological, developmental, cultural and social interests equitably.

(3) Development must be socially, environmentally and economically sustainable.

(4) *(a)* Sustainable development requires the consideration of all relevant factors including the following:

(i) That the disturbance of ecosystems and loss of biological diversity are avoided, or, where they cannot be altogether avoided, are minimised and remedied:

(ii) into account the limits of current knowledge about the consequences of decisions and actions; and

(iii) that negative impacts on the environment and on people's environmental rights be anticipated and prevented, and where they cannot be altogether prevented, are minimised and remedied.

(iv) that pollution and degradation of the environment are avoided, or, where they cannot be altogether avoided, are minimised and remedied;

(v) that the disturbance of landscapes and sites that constitute the nation's cultural heritage is avoided, or where it cannot be altogether avoided, is minimised and remedied;

(vi) that waste is avoided. or where it cannot be altogether avoided, minimised and re-used or recycled where possible and otherwise disposed of in a responsible manner;

(vii) that the use and exploitation of non-renewable natural resources is responsible and equitable, and takes into account the consequences of the depletion of the resource;

viii) that the development, use and exploitation of renewable resources and the ecosystems of which they are part do not exceed the level beyond which their integrity is jeopardised;

(ix) that a risk-averse and cautious approach is applied, which takes

(b) Environmental management must be integrated, acknowledging that all elements of the environment are linked and interrelated, and it must take into account the effects of decisions on all aspects of the environment and all people in the environment by pursuing the selection of the best practicable environmental option.

(c) Environmental justice must be pursued so that adverse environmental impacts shall not be distributed in such a manner as to unfairly discriminate against any person, particularly vulnerable and disadvantaged persons.
(d) Equitable access to environmental resources, benefits and services to meet basic human needs and ensure human well-being must be pursued and special measures may be taken to ensure access thereto by categories of persons disadvantaged by unfair discrimination.
(e) Responsibility for the environmental health and safety consequences of a policy, programme, project, product, process, service or activity exists throughout its life cycle.
(f) The participation of all interested and affected parties in environmental governance must be promoted, and all people must have the opportunity to develop the understanding, skills and capacity necessary for achieving equitable and effective participation, and participation by vulnerable and disadvantaged persons must be ensured.
(g) Decisions must take into account the interest, needs and values of all the interested and affected parties, and this includes recognizing all forms of knowledge, including traditional and ordinary knowledge.
(h) Community wellbeing and empowerment must be promoted through environmental education, the raising of environmental awareness, the sharing of knowledge and experience and other appropriate means.
(i) The social, economic and environmental impacts of activities, including disadvantages and benefits must be considered, assessed and evaluated and decisions must be appropriate in the light of such consideration and assessment.
j) The right of workers to refuse work that is harmful to human health or the environment and to be informed of dangers must be respected and protected.
(k) Decisions must be taken in an open and transparent manner, and access to information must be provided in accordance with the law.
(l) There must be intergovernmental co-ordination and harmonisation of policies, legislation and actions relating to the environment.
(m) Actual or potential conflicts of interest between organs of state should be resolved through conflict resolution procedures.
(n) Global and international responsibilities relating to the environment must be discharged in the national interest.
(o) The environment is held in public trust for the people. The beneficial use of environmental resources must serve the public interest and the environment must be protected as the people's common heritage.
(p) The costs of remedying pollution, environmental degradation and consequent adverse health effects and of preventing, controlling or minimising further pollution, environmental damage or adverse health effects must be paid for by those responsible for harming the environment.

(q) The vital role of women and youth in environment management and development must be recognised and their full participation therein must be promoted.
(r) Sensitive, vulnerable, highly dynamic or stressed ecosystems, such as coastal shores, estuaries, wetlands and similar systems require specific attention in management and planning procedures, especially where they are subject to significant human resource usage and development pressure.
The applicant of the proposed project took the following into consideration:
1. That the disturbance of ecosystems and loss of biological diversity are minimised and remedied by implementing the mitigation measures in this document, the EMPr as well as best practices.
2. Environmental management must be integrated
3. Adverse environmental impacts (if any) shall not be distributed in such a manner as to unfairly discriminate against any person, particularly vulnerable and disadvantaged persons.
4. The participation of all interested and affected parties in environmental governance must be promoted by means of the public participation process that forms part of the basic assessment process.
5. Community wellbeing and empowerment must be promoted by providing employment opportunities during the construction as well as operational phase.
6. The right of workers to refuse work that is harmful to human health or the environment

11. APPLICABLE LEGISLATION, POLICIES AND/OR GUIDELINES

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

Title of legislation, policy or guideline	Applicability to the project	Administering authority	Date
National Environmental Management Act, 1998 (Act 107 of 1998)	Construction activities at the Sand Spruit	DESTEA	1998
National Heritage Resources Act (Act No 25 of 1999)	Construction activities at the Sand Spruit	SAHRA	1999
National Environmental Management Biodiversity Act, 2004 (Act 10 of 2004)	Construction activities at the Sand Spruit	DESTEA	2004

Environmental Conservation Act (Act 73 of 1989)	Conservation of the environment, by implementing best practices	DEA / DESTEA	1989
National Environmental Management Biodiversity Act, 2004 (Act 10 0f 2004)	Endangered / Vulnerable vegetation types and Protected Species (TOPS)	DEA / DESTEA	2004
Northern Cape Nature Conservation Act (Act 9 of 2009)(NCNCA)	Conservation of the environment, by implementing best practices	DEA / DESTEA	2009
National Forests Act (Act No. 84 of 1998) (NFA)	Conservation of protected trees (if any)	DAFF	1998
National Veld and Forest Fires Act, Act 101 of 1998 (NVFFA)	Mitigation measures to be implemented in case of a fire	DAFF	1998
NEM Laws Amendment Act Department (Act 25 of 2014)	Amended regulations for the Public Participation Process	DEA / DESTEA	2014
National Water Act, 1998 (Act 36 of 1998)	Construction activities at the Sand Spruit	DWS	1998

12. WASTE, EFFLUENT, EMISSION AND NOISE MANAGEMENT

a) Solid waste management

Will the activity produce solid construction waste during the construction/initiation phase?	YES
If YES, what estimated quantity will be produced per month?	Unknown m^3

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

The contractor will be responsible for the disposal of waste generated during the construction phase. The contractor will remove the construction waste and dispose thereof at a suitable authorized landfill site.

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

Solid waste disposal sites in Senekal. Hazardous waste (if any) should be disposed of at a suitable authorized hazardous landfill site such as Holfontein.

Will the activity produce solid waste during its operational phase?	NO
If YES, what estimated quantity will be produced per month?	m^3

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

It is not anticipated that the proposed project will generate solid waste during the operational phase.

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

It is not anticipated that the proposed project will generate solid waste during the operational phase.

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

It is not anticipated that the proposed project will generate solid waste during the operational phase.

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

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

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

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

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

b) Liquid effluent

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

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

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

If YES, provide the particulars of the facility:

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

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

c) Emissions into the atmosphere

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

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

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

d) Waste permit

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

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

e) Generation of noise

Will the activity generate noise?	YES	
If YES, is it controlled by any legislation of any sphere of government?	YES	

Describe the noise in terms of type and level:

- Noise associated with the development activities will be from general vehicular activities as well as construction activities including blasting, when required.
- Heavy vehicles will be equipped with silencers.
- A blasting permit will be obtained before blasting activities is undertaken.
- The adjacent landowners will be notified of proposed blasting 24 hours prior to blasting activities.
- In addition, construction activities will be limited to day time hours, where possible.
- Noise levels will have to comply with the requirements as set out in the OHS Act.

13. WATER USE

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

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

If water is to be extracted from groundwater, river, stream, dam, lake or any other natural feature, please indicate the volume that will be extracted per month:	Unknown Litres
Does the activity require a water use authorisation (general authorisation or water use license) from the Department of Water Affairs?	YES /

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

NOTE:
Construction activities will be undertaken within a watercourse. An application will be submitted to DWS in due time.

14. ENERGY EFFICIENCY

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

The following were considered by the applicant:
- Minimum efficiencies permitted on electrical equipment
- Energy optimisation of equipment
- Energy efficient temporarily lightning (if required, during the construction phase)

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

N/A

SECTION B: SITE/AREA/PROPERTY DESCRIPTION

Important notes:

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

Section B Copy No. (e.g. A): [ ]

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

3. Has a specialist been consulted to assist with the completion of this section? YES [ ]

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

Property description/physical address:

Province	Free State
District Municipality	Thabo Mofutsanyana District Municipality
Local Municipality	Setsoto Local Municipality
Ward Number(s)	3
Farm name and number	Remainder of the farm Zyfer Fontein 246
Portion number	Remainder
SG Code	F 030 000 000 000 246 000 00
Farm name and number	Portion 4 of the farm Zyfer Fontein 246
Portion number	Portion 4
SG Code	F 030 000 000 000 246 000 04

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

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

Remainder of the farm Zyfer Fontein 246: Municipal

Portion 4 of the farm Zyfer Fontein 246: Agricultural. However, the section where the construction activities will be undertaken, falls within a registered servitude.

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

Is a change of land-use or a consent use application required? [ ] NO

1. GRADIENT OF THE SITE

Indicate the general gradient of the site.

Alternative 1Preferred:

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

2. LOCATION IN LANDSCAPE

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

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

3. GROUNDWATER, SOIL AND GEOLOGICAL STABILITY OF THE SITE

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

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

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

4. GROUNDCOVER

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

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

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

Summary of Ecological Report:

The areas surrounding the proposed abstraction works has been degraded and transformed to varying degrees, but with patches of natural vegetation also being present. The areas along the floodplain of the river and portions adjacent to the abstraction works do however still consist of natural vegetation but with several areas being degraded by construction and the existing water works. It should therefore be evident that the surroundings has been degraded and transformed to a significant degree. A portion of remaining natural vegetation has however been observed to the west of the dam and here elements of conservation value was also identified.

The majority of the site and surroundings have been degraded. Remaining natural vegetation is dominated by pioneer species and exotic weeds which confirm a degraded condition. These areas are considered of Low conservation value. Furthermore, the natural vegetation type in this area, Central Free State Grassland, is currently of Least Concern (LC) and therefore does not contribute toward the conservation value of natural vegetation. This is also confirmed by the Free State Biodiversity Management Plan which regards the area as an Ecological Support Area 1 & 2 which, although of low conservation value, does still aid in the functioning of the Sand River. However, the exception to the above, is a portion of remaining natural grassland to the west of the Cyferfontein Dam. Here, a substantial species diversity is present with many protected species and somewhat rarer species also being present. As a consequence, this area is regarded as having a High conservation value and should be excluded from the development and treated as a no-go area. It should be avoided by the proposed development as well as any associated activities, i.e. laydown areas, stockpile yards and vehicle movement. Ample areas are available for construction and it should

not be difficult to avoid this portion. The Sand River itself as well as the associated floodplain and wetland areas should be regarded as having a Very High conservation value.

The proposed abstraction works will affect a portion of the main channel of the Sand River. These impacts are anticipated to be most pronounced during construction and immediately thereafter.

Soil samples taken along the bank of the Sand River indicate a permanent zone of wetness along the marginal zone (water's edge) and is considered that saturated soil conditions exist year-round. These wetland conditions steadily decrease up the bank but it was clear that a seasonal zone of wetness still exists along the banks and seepage areas are also present. Temporary wetland conditions were also observed at the upper boundary of the upper zone and this indicated the border of wetland conditions. The banks and floodplain of the river is quite steep here and consequently an extensive floodplain is absent. The floodplain is narrow, steep and without any visible wetland conditions. The edge between this narrow floodplain and the surrounding terrestrial environment is visible where the steep slope levels off into the surrounding plain and surface dolerite outcrops, indicating the edge of the riparian zone.

The off-channel Cyferfontein storage dam, abstracts water from the main channel and in so doing decreases the baseflow of the river which alters the flow regime significantly. The weir associated with this dam also act as flow barrier, and although not as significant as an in-channel storage dam, would also cause retardation of flow and obstruct flooding events and would therefore impact on the flow and flooding regime of the river. The weir has clearly also resulted in a significant change in the riparian zonation of the river. The baseflow water level has been elevated by the weir, essentially submerging the original and natural marginal zone and lower portion of the lower zone. These zones have now moved up the bank of the river, thus narrowing the original zones and significantly modifying the banks of the river. As can be seen, the weir has clearly had a significant impact on the river.
Several significant impacts has quite significantly affected the river at the site and the bed and bank morphology has also been significantly modified, mostly as a result of the downstream weir. Despite the modifications affecting the Sand River, it is still regarded as a highly sensitive system providing numerous vital ecosystem functions including water transportation, aquatic and wetland habitat, flood attenuation and bioremediation functions.
The Sand River which will be affected by the abstraction works is still natural to a significant extent although moderately modified by large impacts associated with the downstream weir, Cyferfontein Dam and upstream dryland crop cultivation. An Index of Habitat Integrity (IHI) was conducted

and indicated that the river has an Instream and Riparian IHI of Category C: Moderately Modified. The EI&S of the Sand River has been rated as being Moderate.

A Risk Assessment for the proposed abstraction works within the Sand River has been undertaken according to the Department of Water & Sanitation's requirements for risk assessment and the provisional Risk Assessment Matrix for Section 21(c) & (i) water use. The majority of impacts should occur during the construction phase and should largely be limited to it, provided that adequate rehabilitation and monitoring is undertaken after construction has been completed. The initial impacts of construction will entail the removal of riparian vegetation and substantial disturbance of the banks of the river at the abstraction site. This will destabilise the bank of the river and will result in erosion of the bank and sedimentation of the river. The construction works will also require the construction of a temporary coffer dam which will allow for dewatering a portion of the main channel of the river to allow for construction to take place. This will also have substantial impacts on the river. Initial impacts will be high when disturbance and infilling of the bed is undertaken. This is likely to release high volumes of sediment into the river. During construction this coffer dam will also require continuous dewatering in order to ensure that the construction area remains dry for construction. This water infiltration is also highly likely to become contaminated by construction waste such as cement, oils and grease and similar construction materials. The proposed abstraction works will result in significant impacts on the banks and main channel of the river. A comprehensive monitoring programme should therefore be followed to quantify impacts and recommend mitigation.

Taking into consideration all of the above and provided that adequate mitigation as recommended is implemented at the site, the proposed abstraction works should be limited to a moderate risk activity.

5. SURFACE WATER

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

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

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

The proposed abstraction works will take place within the Sand River which is located near the Cyferfontein Dam situated approximately 9 km to the north of the small town of Senekal. Soil samples taken along the bank of the Sand River indicate a permanent zone of wetness along the marginal zone (water's edge) and is considered that saturated soil conditions exist year-round. These wetland conditions steadily decrease up the bank but it was clear that a seasonal zone of wetness still exists along the banks and seepage areas are also present. Temporary wetland conditions were also observed at the upper boundary of the upper zone and this indicated the border of wetland conditions. The banks and floodplain of the river is quite steep here and consequently an extensive floodplain is absent. The floodplain is narrow, steep and without any visible wetland conditions. The edge between this narrow floodplain and the surrounding terrestrial environment is visible where the steep slope levels off into the surrounding plain and surface dolerite outcrops, indicating the edge of the riparian zone.

6. LAND USE CHARACTER OF SURROUNDING AREA

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

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

NOTE:
The existing Abstraction Works were constructed in the 1970's as part of the De Put Water Scheme in order to provide potable water to the town Senekal.

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

N/A

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

N/A

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

N/A

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

Critical Biodiversity Area (as per provincial conservation plan)		NO Within Ecological Support Area 1 as well as Ecological Support Area 2; Vulnerable Ecosystem (although of low conservation value, does still aid in the functioning of the Sand River)
Core area of a protected area?		NO
Buffer area of a protected area?		NO
Planned expansion area of an existing protected area?		NO
Existing offset area associated with a previous Environmental		NO

Authorisation?		
Buffer area of the SKA?		NO

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

7. CULTURAL/HISTORICAL FEATURES

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

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

There are no indications of Stone Age artifacts, prehistoric structures, graves or rock engravings within the footprint. The site is underlain by geologically recent (cf. late Holocene) alluvium associated with adjacent Sand River overburden. There is no evidence for the accumulation and preservation of intact fossil material within these late Quaternary sediments. Fine- to medium-grained Adelaide Subgroup sandstone and Jurassic-age dolerite are outcropping along high ground to the east and south of the footprint, respectively. Potential for palaeontological impact is considered low given age of the unconsolidated sediments underlying the proposed footprint. The latter sediments, also appear to cap a dolerite knickpoint intersecting the river. The proposed development footprint is not considered archaeologically vulnerable. There are no major archaeological grounds to suspend the proposed development, provided that all excavation activities are confined to within the confines of the development footprint. The study area is considered to be of low archaeological significance and is assigned a site rating of Generally Protected C.

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

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

8. SOCIO-ECONOMIC CHARACTER

a) Local Municipality

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

NOTE:

According to Census 2011, Setsoto Local Municipality has a population of 110 335, of whom 92,3% are black African, 5,7% are white, with the remaining 2% made up by other population groups. The majority of the population, that is 62%, is between 15 and 64 years of age. The age group 0 to 14 years accounts for 32% of the population. Of those aged 20 years and above, approximately 8,7% have no formal schooling, 22,6% have completed matric, and 6,9% have some form of higher education.
According to Census 2011, the town Senekal has a total population of 3 466 people, of whom 53,0% are black African, 1.4% are coloured, 42.8% are white and 1.7% are Indian/Asian. The other population groups make up the remaining percentages.

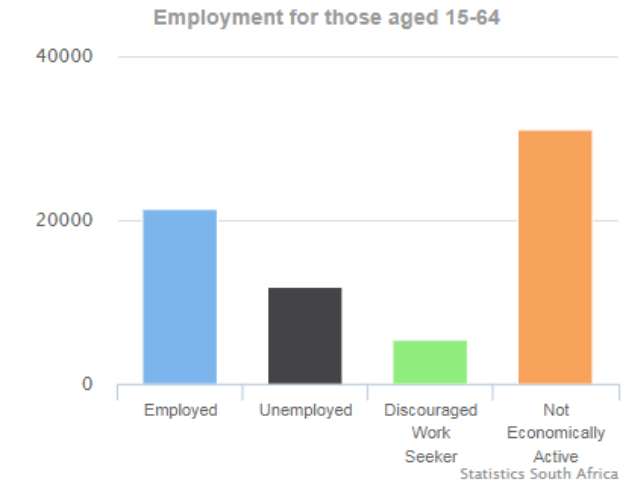
The population estimates for Senekal-Matwabeng as calculated by DWS are provided below. The proposed project will service an estimated 41 324 community members in the year 2045.

* 2001 – 22 551
* 2011 – 25 543
* 2015 – 29 464
* 2020 – 31 173
* 2045 – 41 324

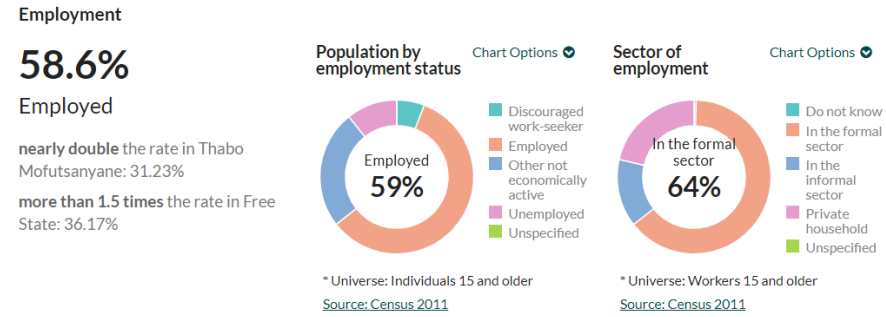
The following information was obtained from:
http://www.statssa.gov.za &
https://wazimap.co.za/profiles/ward-41901003-setsoto-ward-3-41901003

Level of unemployment:

Setsoto Local Municipality:

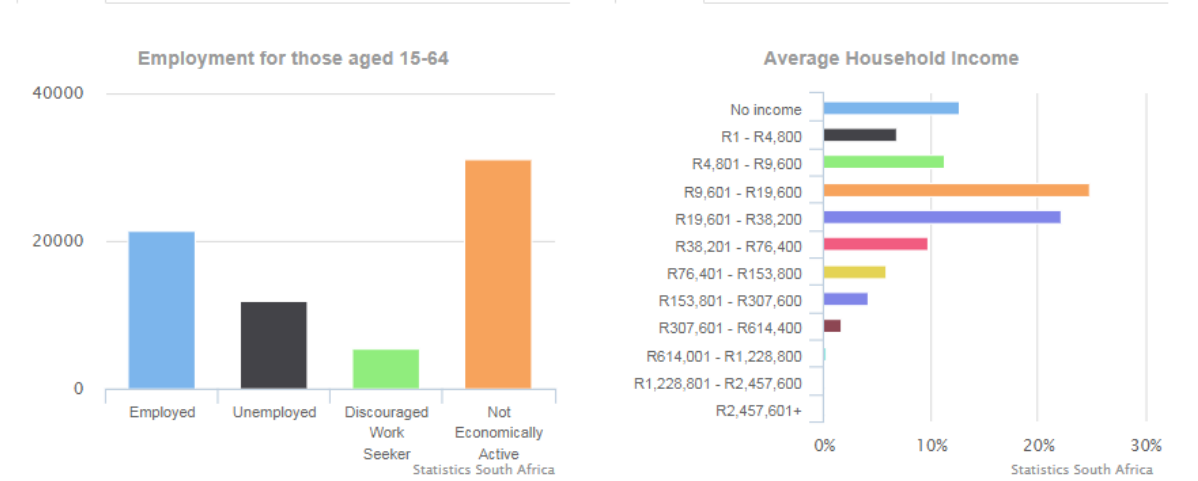


Ward 3:

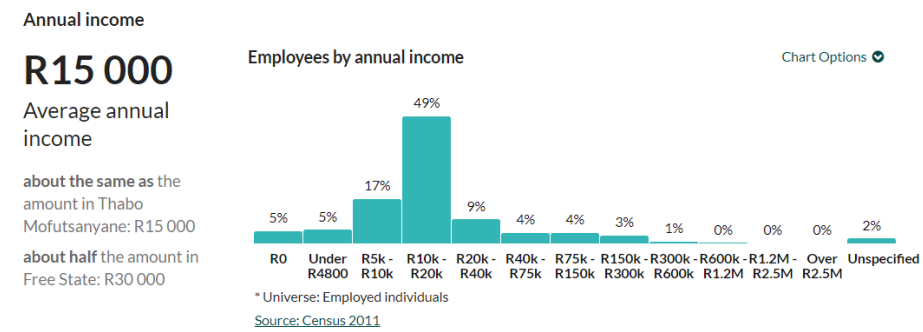


Economic profile of local municipality:

Setsoto Local Municipality:

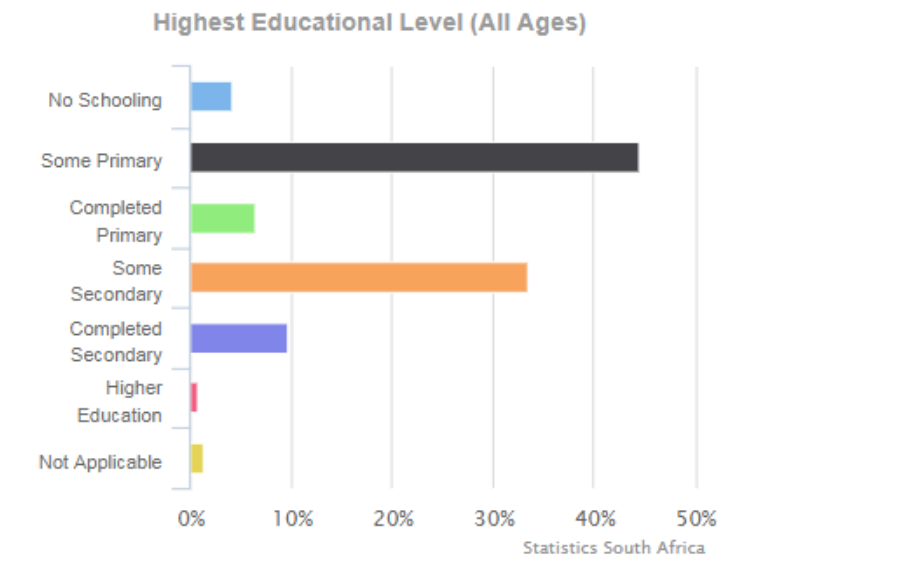


Ward 3:

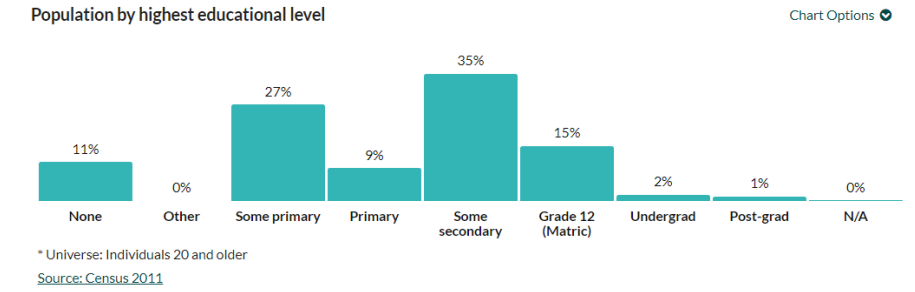


Level of education:

Setsoto Local Municipality:



Ward 3:



b) Socio-economic value of the activity

What is the expected capital value of the activity on completion?	Unknown

What is the expected yearly income that will be generated by or as a result of the activity?	Unknown	
Will the activity contribute to service infrastructure?	YES	
Is the activity a public amenity?	YES	
How many new employment opportunities will be created in the development and construction phase of the activity/ies?	Unknown	
What is the expected value of the employment opportunities during the development and construction phase?	Unknown	
What percentage of this will accrue to previously disadvantaged individuals?	Unknown	
How many permanent new employment opportunities will be created during the operational phase of the activity?	Unknown	
What is the expected current value of the employment opportunities during the first 10 years?	Unknown	
What percentage of this will accrue to previously disadvantaged individuals?	Unknown	

9. BIODIVERSITY

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

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

Systematic Biodiversity Planning Category	If CBA or ESA, indicate the reason(s) for its selection in biodiversity plan

Critical Biodiversity Area (CBA)	Ecological Support Area (ESA)	Other Natural Area (ONA)	No Natural Area Remaining (NNR)	According to the Ecological Report, the site for the proposed abstraction works is listed as being Ecological Support Areas 1 & 2 (ESA 1 & 2). This indicates that the area has been degraded to varying degrees by the surrounding landuse but forms part of the functioning of the Sand River and as a result does provide important functions in the support of this system. Please refer to the Ecological Report for more information.

b) Indicate and describe the habitat condition on site

Habitat Condition	Percentage of habitat condition class (adding up to 100%)	Description and additional Comments and Observations (including additional insight into condition, e.g. poor land management practises, presence of quarries, grazing, harvesting regimes etc).
Natural	%	
Near Natural (includes areas with low to moderate level of alien invasive plants)	%	
Degraded (includes areas heavily invaded by alien plants)	100%	The areas surrounding the proposed abstraction works has been degraded and transformed to varying degrees, but with patches of natural vegetation also being present. This is confirmed, to some degree, by the National Biodiversity Assessment (2018), which indicates that the Cyferfontein Dam and areas to the south of it is transformed and no longer regarded as consisting of natural vegetation. The areas along the floodplain of the river and portions adjacent to the abstraction works do however still consist of natural vegetation but with several areas being degraded by construction and the existing water works. Large areas have been

		transformed by historical crop cultivation and these areas are most prominent to the south of the dam. The dam itself is also responsible for transformation of a significant portion of vegetation while associated structures, buildings, reservoirs, pipelines, powerlines, dirt tracks and pump stations has also resulted in transformation and degradation of the natural vegetation. It should therefore be evident that the surroundings has been degraded and transformed to a significant degree. A portion of remaining natural vegetation has however been observed to the west of the dam and here elements of conservation value was also identified.
Transformed (includes cultivation, dams, urban, plantation, roads, etc)	%	

c) Complete the table to indicate:

(i) the type of vegetation, including its ecosystem status, present on the site; and
(ii) whether an aquatic ecosystem is present on site.

Terrestrial Ecosystems		**Aquatic Ecosystems**		
Ecosystem threat status	Critical	Wetland (including	Estuary	Coastline
	Endangered			

Terrestrial Ecosystems		Aquatic Ecosystems		
as per the National Environmental Management: Biodiversity Act (Act No. 10 of 2004)	Vulnerable The areas surrounding the proposed abstraction works has been degraded and transformed to varying degrees, but with patches of natural vegetation also being present. This is confirmed, to some degree, by the National Biodiversity Assessment (2018), which indicates that the Cyferfontein Dam and areas to the south of it is transformed and no longer regarded as consisting of natural vegetation. The areas along the floodplain of the river and portions adjacent to the abstraction works do however still consist of natural vegetation but with several areas being degraded by construction and the existing water works. Large areas have been transformed by historical crop cultivation and these areas are most prominent to the south of the dam. The dam itself is also responsible for transformation of a significant portion of vegetation while associated structures, buildings, reservoirs, pipelines, powerlines, dirt tracks and pump stations has also resulted in transformation and degradation of the natural vegetation. It should therefore be evident that the surroundings has been degraded and transformed to a significant degree. A portion of remaining natural vegetation has however been observed to the west of the dam and here elements of conservation value was also identified.	rivers, depressions, channelled and unchanneled wetlands, flats, seeps pans, and artificial wetlands)		
	Least Threatened			

Terrestrial Ecosystems		Aquatic Ecosystems						
		YES	NO	UNSURE	YES	NO	YES	NO

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

The areas surrounding the proposed abstraction works has been degraded and transformed to varying degrees, but with patches of natural vegetation also being present. The areas along the floodplain of the river and portions adjacent to the abstraction works do however still consist of natural vegetation but with several areas being degraded by construction and the existing water works. It should therefore be evident that the surroundings has been degraded and transformed to a significant degree. A portion of remaining natural vegetation has however been observed to the west of the dam and here elements of conservation value was also identified.

The majority of the site and surroundings have been degraded. Remaining natural vegetation is dominated by pioneer species and exotic weeds which confirm a degraded condition. These areas are considered of Low conservation value. Furthermore, the natural vegetation type in this area, Central Free State Grassland, is currently of Least Concern (LC) and therefore does not contribute toward the conservation value of natural vegetation. This is also confirmed by the Free State Biodiversity Management Plan which regards the area as an Ecological Support Area 1 & 2 which, although of low conservation value, does still aid in the functioning of the Sand River. However, the exception to the above, is a portion of remaining natural grassland to the west of the Cyferfontein Dam. Here, a substantial species diversity is present with many protected species and somewhat rarer species also being present. As a consequence, this area is regarded as having a High conservation value and should be excluded from the development and treated as a no-go area. It should be avoided by the proposed development as well as any associated activities, i.e. laydown areas, stockpile yards and vehicle movement. Ample areas are available for construction and it should not be difficult to avoid this portion. The Sand River itself as well as the associated floodplain and wetland areas should be regarded as having a Very High conservation value.

The proposed abstraction works will affect a portion of the main channel of the Sand River. These impacts are anticipated to be most pronounced during construction and immediately thereafter.

Soil samples taken along the bank of the Sand River indicate a permanent zone of wetness along the marginal zone (water's edge) and is considered that saturated soil conditions exist year-round. These wetland conditions steadily decrease up the bank but it was clear that a seasonal zone of wetness still exists along the banks and seepage areas are also present. Temporary wetland conditions were also observed at the upper boundary of the upper zone and this indicated the border of wetland conditions. The banks and floodplain of the river is quite steep here and consequently an extensive floodplain is absent. The floodplain is narrow, steep and without any visible wetland conditions. The edge between this narrow floodplain and the surrounding terrestrial environment is visible where the steep slope levels off into the surrounding plain and surface dolerite outcrops, indicating the edge of the riparian zone.

The off-channel Cyferfontein storage dam, abstracts water from the main channel and in so doing decreases the baseflow of the river which alters the flow regime significantly. The weir associated with this dam also act as flow barrier, and although not as significant as an in-channel storage dam, would also cause retardation of flow and obstruct flooding events and would therefore impact on the flow and flooding regime of the river. The weir has clearly also resulted in a significant change in the riparian zonation of the river. The baseflow water level has been elevated by the weir, essentially submerging the original and natural marginal zone and lower portion of the lower zone. These zones have now moved up the bank of the river, thus narrowing the original zones and significantly modifying the banks of the river. As can be seen, the weir has clearly had a significant impact on the river.
Several significant impacts has quite significantly affected the river at the site and the bed and bank morphology has also been significantly modified, mostly as a result of the downstream weir. Despite the modifications affecting the Sand River, it is still regarded as a highly sensitive system providing numerous vital ecosystem functions including water transportation, aquatic and wetland habitat, flood attenuation and bioremediation functions.
The Sand River which will be affected by the abstraction works is still natural to a significant extent although moderately modified by large impacts associated with the downstream weir, Cyferfontein Dam and upstream dryland crop cultivation. An Index of Habitat Integrity (IHI) was conducted and indicated that the river has an Instream and Riparian IHI of Category C: Moderately Modified. The EI&S of the Sand River has been rated as being Moderate.

A Risk Assessment for the proposed abstraction works within the Sand River has been undertaken according to the Department of Water & Sanitation's requirements for risk assessment and the provisional Risk Assessment Matrix for

Section 21(c) & (i) water use. The majority of impacts should occur during the construction phase and should largely be limited to it, provided that adequate rehabilitation and monitoring is undertaken after construction has been completed. The initial impacts of construction will entail the removal of riparian vegetation and substantial disturbance of the banks of the river at the abstraction site. This will destabilise the bank of the river and will result in erosion of the bank and sedimentation of the river. The construction works will also require the construction of a temporary coffer dam which will allow for dewatering a portion of the main channel of the river to allow for construction to take place. This will also have substantial impacts on the river. Initial impacts will be high when disturbance and infilling of the bed is undertaken. This is likely to release high volumes of sediment into the river. During construction this coffer dam will also require continuous dewatering in order to ensure that the construction area remains dry for construction. This water infiltration is also highly likely to become contaminated by construction waste such as cement, oils and grease and similar construction materials. The proposed abstraction works will result in significant impacts on the banks and main channel of the river. A comprehensive monitoring programme should therefore be followed to quantify impacts and recommend mitigation.

Taking into consideration all of the above and provided that adequate mitigation as recommended is implemented at the site, the proposed abstraction works should be limited to a moderate risk activity.

SECTION C: PUBLIC PARTICIPATION

1. ADVERTISEMENT AND NOTICE

Publication name	BloemNews	
Date published	24 February 2022	
Site notice position	**Latitude**	**Longitude**
	28°14'31.63"S	27°39'26.48"E
Date placed	28 February 2022	

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

2. DETERMINATION OF APPROPRIATE MEASURES

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

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

Title, Name and Surname	Affiliation/ key stakeholder status	Contact details (tel number or e-mail address)
Thabo Mofutsanyana District Municipality	The Municipal Manager	Ms. Takatso Lebenya Tel: (058) 718 1036 / 1089 Fax: (058) 718 1034 Email: takatso@tmdm.gov.za Private Bag X810, Witsieshoek, 9870 1 Mampoi Street, Old Parliament Building, Phuthaditjhaba
Setsoto Local Municipality	Municipal Manager	Mr. Tshepiso "Sugar" Ramakarane Fax: (+27 51) 933 9363 Email: tshepiso@setsoto.co.za and manager@setsoto.co.zaTel: (+27 51) 933 9302 27 Voortrekker Street, Ficksburg PO Box 116, Ficksburg, 9730
Setsoto Local Municipality:	Ward 3: Cllr. Mamotena Lydia	27 Voortrekker Street, Ficksburg

Title, Name and Surname	Affiliation/ key stakeholder status	Contact details (tel number or e-mail address)
Ward Councillor: Wards 3	Mthimkulu	PO Box 116, Ficksburg, 9730
Head of Department: Agriculture	The Assistant Director	P.O. Box 34521 Faunasig Bloemfontein 9325
Department of Public Works: Property Manager	Ms Agnes Ntilane (Strategic Asset Management – Property Portfolio)	Provincial Government of the Free State Department of Land Affairs Director Property Management of the Provincial Department of Public Works & Infrastructure Ms Agnes Ntilane 136 Charlotte Mareka Street Bloemfontein 9300 Ntilanea@fsworks.gov.za
Department of Water and Sanitation	Mr. W Grobler	Private Bag X528 Bloemfontein 9300 GroblerW@dws.gov.za
SAHRA		South African Heritage Resources Agency (SAHRA) Head Office 111 Harrington Street CAPE TOWN 8001
SAHRA Free State	Heritage Coordinator	Ntando PZ Mbatha Corner Henry and East Burger Street Department of Sport Arts Culture and Recreation Office 204 Bloemfontein 9301
SANRAL	Statutory Control: Eastern Region	Statutory Control: Eastern Region 58 Van Eck Place Mkondeni Pietermaritzsburg 3201
CAA	Civil Aviation	011 545 1232

Title, Name and Surname	Affiliation/ key stakeholder status	Contact details (tel number or e-mail address)
	Authority	strohl@caa.co.za
ESKOM	Land and Rights Officer Environmental Officer	Phindi Rapudungoane Land and Rights Officer Tell: 051 4042284 Fax: 086 5398399 Phindi.Rapudungoane@eskom.co.za Mahlatse Moeng Environmental Officer Land Development and Environment Eskom Distribution-FSOU Eskom Centre First Floor 120 Henry Street Westdene Bloemfontein Tel: 051 404 2287 Cell: 079 199 0679 Fax: 086 604 5709 Email: Mahlatse.Moeng@eskom.co.za

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

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

3. ISSUES RAISED BY INTERESTED AND AFFECTED PARTIES

Summary of main issues raised by I&APs	Summary of response from EAP
No comments received to date	All comments received will be included in the Final BAR document

4. COMMENTS AND RESPONSE REPORT

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

5. AUTHORITY PARTICIPATION

Authorities and organs of state identified as key stakeholders:

Authority/ Organ of State	Contact person (Title, Name and Surname)	Tel No	Fax No	e-mail	Postal address
Thabo Mofutsanyana District Municipality	Municipal Manager Ms. Takatso Lebenya	(058) 718 1036 / 1089	(058) 718 1034	takatso@tmdm.gov.za	Private Bag X810 Witsieshoek 9870
Setsoto Local Municipality: Municipal Manager	Municipal Manager Mr. Tshepiso "Sugar" Ramakarane	(051) 933 9302	(051) 933 9363	tshepiso@setsoto.co.za and manager@setsoto.co.za	PO Box 116,Ficksburg 9730
Setsoto Local Municipality: Ward Councillor: Ward 3	Ward 3: Cllr. Mamotena Lydia Mthimkulu	(051) 933 9302	(051) 933 9363		PO Box 116 Ficksburg 9730
Head of Department: Agriculture	The Assistant Director				P.O. Box 34521 Faunasig Bloemfontein 9325
Department of Public Works: Property Manager	Ms Agnes Ntilane (Strategic Asset Managem				

Authority/ Organ of State	Contact person (Title, Name and Surname)	Tel No	Fax No	e-mail	Postal address
	ent – Property Portfolio)				
Department of Water and Sanitation	Mr Grobler				Private Bag X528 Bloemfontein 9300
SAHRA	South African Heritage Resources Agency (SAHRA) Head Office				111 Harrington Street CAPE TOWN 8001
SAHRA Free State	Heritage Coordinator Ntando PZ Mbatha				Corner Henry and East Burger Street Department of Sport Arts Culture and Recreation Office 204 Bloemfontein 9301
CAA	Lizell Stroh Obstacle Inspector	011 545 1232		strohl@caa.co.za	
ESKOM	Land and Rights Officer And Environmental Officer	051 404 2287	086 604 5709	Phindi.Rapudungoane@eskom.co.za Mahlatse.Moeng@eskom.co.za	Eskom Distribution-FSOU Eskom Centre First Floor 120 Henry Street Westdene Bloemfontein 9300

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

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

6. CONSULTATION WITH OTHER STAKEHOLDERS

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

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

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

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

SECTION D: IMPACT ASSESSMENT

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

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

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

Compliance and Monitoring			
Activity	**Impact summary**	**Significance**	**Proposed mitigation**
Record keeping of compliance and monitoring reports	**Direct impacts:** • Non-conformance	**Without Mitigation:** High Negative **With Mitigation:** Low Negative	• The applicant will ensure that the contractors adhere to the recommendations of the EMPr and conditions of the Environmental Authorisation during construction. • An Environmental Control Officer (ECO) will be appointed to monitor the construction phase. Note that the ECO may be appointed separately or can be part of the contractor's team. • Regular monitoring and / or spot inspections at least every fortnight during the construction phase is recommended. • Inspections should be documented, and any shortcomings addressed immediately. • A report will be provided by the independent ECO to the contractor upon completion thereof. The findings thereof should be made available to the competent authority (for example DESTEA, DWS), should it be requested. • Any emergency or unforeseen impact will be reported to the relevant environmental department within 24 hours after identification for telephonic approval and
	Indirect impacts: • Non-conformance	**Without Mitigation:** High Negative **With Mitigation:** Low Negative	
	Cumulative impacts: • Non-conformance	**Without Mitigation:** High Negative **With Mitigation:** Low Negative	

Compliance and Monitoring			
Activity	**Impact summary**	**Significance**	**Proposed mitigation**
			will be confirmed in writing. • During the operational phase, infrastructure must be routinely audited, and themaintenance schedule adjusted accordingly. • Material Safety Data Sheets (MSDS) should be available on site. Where possible and available, MSDS should include information on ecological impacts and measures to minimize negative environmental impacts during accidental releases or escapes. • Procedures in the MSDS should be implemented in case of an emergency • The following documents should be available on site, and made available to the competent authority on request (if applicable): - Complaints Register - Environmental Incident Register - Disposal Certificates of waste generated as a result of the construction activities. - Environmental Monitoring (Audit) Reports - Written Corrective Action Instructions - Environmental Authorisation - DWS Authorisation

Compliance and Monitoring			
Activity	**Impact summary**	**Significance**	**Proposed mitigation**
			- Blasting Permit - EMPr

Planning and Design phase			
Activity	**Impact summary**	**Significance**	**Proposed mitigation**
Planning and design **NOTE:** Should the following aspects not be taken into consideration during the Planning and Design Phase, the environmental impacts associated with the construction and operation phase will be of high significance as the environment will be negatively affected.	**Direct impacts:** • Spillages • Erosion	**Without Mitigation:** Medium - High Negative **With Mitigation:** Low Negative	• No environmental mitigation measures are to be implemented on site during the planning phase. • However, the applicant, engineers, environmental consultants, and specialists should take the following steps during the planning phase: - Permits will be obtained for the removal / transplantation of protected species (if any) that are located within the construction area where no alternatives are possible. - A monitoring system should be implemented to determine the occurrence (if any) of any fuel / oil spillages during the construction phase. - The necessary Environmental Authorisation will be obtained before any activities listed in the Regulations are undertaken. - The necessary precautions with regard to road safety will be implemented for construction work to be undertaken within road crossings (if any). - Proper sanitation, potable water and
	Indirect impacts: • Soil and surface water pollution • Loss of soil • Loss of vegetation	**Without Mitigation:** Medium - High Negative **With Mitigation:** Low Negative	
	Cumulative impacts: • Groundwater pollution • Loss of vegetation • Negative impact on wetland system	**Without Mitigation:** Medium - High Negative **With Mitigation:** Low Negative	

Planning and Design phase			
Activity	**Impact summary**	**Significance**	**Proposed mitigation**
			waste facilities will be in place before construction activities are undertaken. - A blasting permit will be obtained before blasting activities is undertaken (if any). - The design and layout of the proposed project will take the possibility of flooding, erosion and pollution into consideration.

Construction phase			
Activity	**Impact summary**	**Significance**	**Proposed mitigation**
General measures to consider	**Direct impacts:** • Loss of vegetation • Loss of animal life • Erosion • Pollution • Noise • Nuisance dust	**Without Mitigation:** High Negative **With Mitigation:** Low Negative	• Any construction is disruptive and the environment must be given consideration with every activity undertaken • All relevant standards relating to legislation should be adhered to (including waste emissions, waste disposal, noise regulations, etc.) • According to Section 28 of the NEMA Act 107, every person who cause, has caused or may cause significant pollution or degradation of the environment must take reasonable measures to prevent such pollution or degradation from occurring, continuing or recurring and if it can't be avoided or stopped, to minimize and rectify such pollution or degradation of the environment. • The pollution control provision in Section 19(1) of the National Water Act (Act 36 of 1998) should be adhered to at all times. • ECO should be provided with a layout of the site, indicating the position of the following prior to the site establishment, for acceptance:
	Indirect impacts: • Possible outbreaks of fire • Pollution (groundwater, surface water, soil and air) • Erosion • Loss of biodiversity (vegetation & animal life) • Nuisance dust	**Without Mitigation:** High Negative **With Mitigation:** Low Negative	
	Cumulative impacts: • Possible outbreaks of fire • Pollution (groundwater, surface water, soil and air)	**Without Mitigation:** High Negative **With Mitigation:** Low Negative	

Construction phase			
Activity	**Impact summary**	**Significance**	**Proposed mitigation**
	• Erosion • Loss of biodiversity (vegetation & animal life)		- Ablution Facilities - Storage Areas - Ready-mix Areas (if any) - Stockpile Areas - Waste Disposal Facilities - Hazardous Substances Storage Area - Etc. • Designate the boundaries of the active construction start-up site, by erecting fencing / danger tape (where applicable) • Fence off operational footprint area (if possible) to ensure all operational activities are contained within the designate area. • All construction and operational activities must be contained within the demarcated servitude determined in consultation with the ECO. • Care will be taken to prevent unnecessary damage to vegetation near to construction activities. • The necessary precautions with regard to road safety will be implemented for construction work within road crossings (if any). • Proper sanitation, water and waste

Construction phase			
Activity	**Impact summary**	**Significance**	**Proposed mitigation**
			facilities will be in place for construction workers throughout the construction phase. • Chemical toilets will be cleaned and serviced regularly, and proof thereof will be available on site. • Potable water will be made available daily to workers on site. • Fire-fighting equipment will be available on site, where applicable. • If artefacts or graves are uncovered during construction activities, work in the immediate vicinity will be stopped until the project Archaeologist and SAHRA has been consulted. • Adjacent landowners will be notified of proposed blasting, 24 hours prior to blasting activities.
Site access	**Direct impacts:** • Loss of vegetation • Loss of animal life • Erosion • Pollution • Storm water contamination	**Without Mitigation:** Medium Negative **With Mitigation:** Low Negative	• Necessary drawings for the upgrading of intersections (if any) are to be submitted to the relevant authority (SANRAL / Provincial Department of Roads / Municipality's Department of Roads) for approval, and the upgrades are to be implemented • The current access road should be

Construction phase			
Activity	**Impact summary**	**Significance**	**Proposed mitigation**
	Indirect impacts: • Loss of vegetation • Loss of animal life • Erosion • Surface water contamination	**Without Mitigation:** High Negative **With Mitigation:** Low Negative	improved, when required • Proper storm water measures are to be implemented to avoid run-off of water and washing of sand / soil onto the road • Erosion measures will be implemented • Removal of vegetation will be kept to the required area • No animals will be hunted / captured on site (only to be undertaken by a relevant specialist)
	Cumulative impacts: • Loss of vegetation • Loss of animal life • Erosion • Surface and groundwater contamination	**Without Mitigation:** High Negative **With Mitigation:** Low Negative	
Employee conduct on site	**Direct impacts:** • Loss of vegetation • Loss of animal life • Erosion • Pollution • Storm water contamination • Occurrence of waste on site • Various health and safety aspects	**Without Mitigation:** Medium Negative **With Mitigation:** Low Negative	• No animals may be harmed / captured / trapped and / or hunted. This must be strictly enforced. • Animals found at the construction site will be removed and relocated to an appropriate area, by a suitable, qualified person. • No open fires allowed. Provision will be made that no accidental fires are started. • No firewood will be collected on site or in surrounding areas, without written approval from the landowner.
	Indirect impacts:	**Without Mitigation:**	

Construction phase			
Activity	**Impact summary**	**Significance**	**Proposed mitigation**
	• Loss of vegetation • Loss of animal life • Erosion • Pollution • Storm water contamination • Occurrence of waste on site • Various health and safety aspects • Fire outbreaks	High Negative **With Mitigation:** Low Negative	• No smoking or open fires will be allowed near storage facilities • No waste may be dumped on site • Employees should make use of the ablution facilities provided
	Cumulative impacts: • Loss of vegetation • Loss of animal life • Erosion • Pollution • Storm water contamination • Occurrence of waste on site • Various health and safety aspects • Fire outbreaks	**Without Mitigation:** Medium Negative **With Mitigation:** Low Negative	

Construction phase			
Activity	**Impact summary**	**Significance**	**Proposed mitigation**
Soil, erosion and vegetation management	**Direct impacts:** • Destruction of vegetation • Loss of topsoil • Loss of vegetative species of conservational concern • Noise elevation due to construction activities • Nuisance dust generation • Visual impact of rock and spoil material dumps	**Without Mitigation:** Medium Negative **With Mitigation:** Low Negative	• Construction activities will be limited to designated construction areas to prevent peripheral impacts on surrounding natural habitats. Construction vehicles will also keep to constructed roads where possible, so that natural vegetation is not destroyed unnecessarily. • Access roads or temporary crossings must be non-erosive, structurally stable and not induce flooding / safety hazard. • If any access road or temporary crossing is impaired, it will be repaired immediately to prevent any future / further damage. • All human movement and activities will be contained within designated construction areas in order to prevent peripheral impacts on surrounding natural habitat. • Erosion management is important. Rehabilitation measures must be monitored to ensure that no erosion has occurred and the disturbed areas have been adequately re-vegetated.
	Indirect impacts: • Erosion • Establishment of alien / invader vegetation species • Possible impact on heritage artefacts • Loss of fauna on site.	**Without Mitigation:** Medium Negative **With Mitigation:** Low Negative	

Construction phase			
Activity	**Impact summary**	**Significance**	**Proposed mitigation**
	Cumulative impacts: • Erosion • Establishment of alien vegetation species	**Without Mitigation:** Medium Negative **With Mitigation:** Low Negative	• Concurrent rehabilitation of disturbed areas will be undertaken to help the recovery of the vegetation. • Stockpiled soil to be used for the rehabilitation of the disturbed area will be stockpiled in an area where it will not be disturbed by vehicles • Stockpiled soil will be protected from washing away during rainstorms. For example: • One layer of bricks or stones can be placed around the stockpiled topsoil. • Bricks may be placed around the stockpiles, to limit the loss thereof due to rainy events. • Stockpiles should not be higher than 1.5 m. • The gradient of stockpiles should not be greater than 1:1.5. • Stockpiles should be located away from drainage lines, watercourses and areas of temporary flood • All excavated / collected soil, is to be separated into top- and subsoil. Subsoil must be used for backfilling and topsoil for landscaping and rehabilitation of

Construction phase			
Activity	**Impact summary**	**Significance**	**Proposed mitigation**
			disturbed areas • Re-spreading of topsoil is to be done to the natural depth , or recommendation by the ecological specialist. • Fertilisers should be used where topsoil and subsoil were mixed or where the topsoil is not up to original standard • Indigenous tree species in the vicinity of the operational site (if any) should be marked with danger tape. Disturbance to such species should be avoided, where possible. • A permit for the removal / cutting / transplanting of protected plant species will be obtained before the removal / cutting / transplantation of these species (if any). • An alien control and monitoring programme will be developed starting during the construction phase and will be carried over into the operational phase. • Any proclaimed weed or alien species that germinates during the contract period will be cleared by hand / approved chemicals before flowering thereof.

Construction phase			
Activity	**Impact summary**	**Significance**	**Proposed mitigation**
			• Imported fill material will be monitored during and after construction for the presence of any alien species. Any such species will be removed immediately. • Fire fighting equipment will be available on site. • Species, especially grasses, trees and shrubs occurring in the region will be used to rehabilitate disturbed areas. • Compacted soils (such as dirt tracks not to be utilised during the operational phase) must be ripped to ensure the establishment of natural occurring vegetation. • Should natural re-growth not be sufficient, the area should be hydro-seeded. • Concurrent rehabilitation should be undertaken, where possible. • Vegetation clearance will be limited to the required area. • Speed limit will be enforced on the construction vehicles and these vehicles will only make use of designated roads / pathways. • Dust control measures will be implemented if nuisance dust generation occurs during

Construction phase			
Activity	**Impact summary**	**Significance**	**Proposed mitigation**
			the construction period. • All archaeological findings (if any) should be recorded and reported to SAHRA. No construction activities in the area may proceed without the authorisation from SAHRA. • Storm water measures will be implemented in order to manage storm water, and this will also prevent erosion. • Visual inspections for the occurrence of erosion should be undertaken on a weekly basis. • No animals may be captured / harmed / killed on site. Animals found at the construction site will be removed and relocated to an appropriate area, by a suitable, qualified person • Any occurrences of harmed animals should be reported to the ECO and recorded as such. • The portion of remaining natural grassland occurring to the west of the Cyferfontein Dam contains many protected plant species, is regarded as being of High Sensitivity and should be treated as no-go

Construction phase			
Activity	**Impact summary**	**Significance**	**Proposed mitigation**
			area. It should be avoided by the proposed development as well as any associated activities, i.e. laydown areas, stockpile yards and vehicle movement. • Ample areas are available for construction and it should not be difficult to avoid this portion. • Disturbance of the banks should be kept to a minimum and erosion remediated where it occurs. Removal of vegetation should also be kept to a minimum. • Access to the construction site should be limited to a single access road. • Adequate design of the abstraction works, monitoring of erosion and the implementation of erosion prevention structures will therefore be of high importance. • Where steep banks occur and erosion is evidently problematic it is recommended that geotextiles be utilised to stabilise soils. Available options include contouring, berms, gabions and geotextile netting. • The watercourse bed and bank morphology should also be re-instated as

Construction phase			
Activity	**Impact summary**	**Significance**	**Proposed mitigation**
			far as possible, which will also speed up the stabilisation of the bed and banks as it will resemble the surrounding river morphology and therefore won't be subjected to additional erosion as opposed to depressions or extrusions which will be subjected to erosion during flooding. • The disturbance caused by construction will also increase the establishment of exotic weeds and invasive species. It will therefore also be important to monitor and eradicate exotic weeds and invasive species where they establish. • When excavating or disturbing the banks the upper 30 cm, or topsoil, should be removed together with the vegetation and stored as sods on the site. These should then be replaced in disturbed areas requiring rehabilitation. • Dewatering of the coffer dam should also entail the implementation of a small attenuation area on the banks and then allowed to infiltrate back into the river, leaving contaminants, including sediments, behind in the attenuation area.

Construction phase			
Activity	**Impact summary**	**Significance**	**Proposed mitigation**
			• Following the completion of the abstraction works, comprehensive rehabilitation of the banks, vegetation or wetland areas should be undertaken. It is important that riparian vegetation be re-established where they were removed. This can be attained by removing sods of the indigenous sedges and grasses as listed for the river and replanting these in disturbed areas • Rehabilitation of the construction site should also include the access road and any construction areas, laydown areas and construction yards. • A comprehensive rehabilitation and monitoring plan should be compiled and implemented in order to ensure the riverbanks are stabilised following construction. • After rehabilitation any excess soil or material should be removed and disposed of at a registered disposal facility. • The proposed abstraction works will result in significant impacts on the banks and main channel of the river. A comprehensive

Construction phase			
Activity	**Impact summary**	**Significance**	**Proposed mitigation**
			monitoring programme should therefore be followed to quantify impacts and recommend mitigation. Such monitoring should include quarterly water quality sampling, sediment release (turbidity), Index of Habitat Integrity and SASS5 or a combination thereof.
Minimise contamination and sterilisation of soil	**Direct impacts:** • Slow regrowth of natural occurring vegetation during the rehabilitation phase • Loss of vegetation	**Without Mitigation:** Medium Negative **With Mitigation:** Low Negative	• Use of potentially polluting and hazardous substances should be strictly controlled • If soil is significantly contaminated by hazardous substances, then this soil is considered as hazardous and should be disposed of according to best practices • Repair / maintenance will be conducted on site, and impacts like oil spills should be appropriately mitigated. Spill response procedures must be clearly defined and well known by all staff. • All threatened or protected plant species as specified by the NEM: Biodiversity Act (2004) will be identified on site. Permits are required for the removal / transplantation of these plants.
	Indirect impacts: • Loss of vegetation • Loss of animal life • Establishment of alien vegetation • Erosion	**Without Mitigation:** High Negative **With Mitigation:** Low Negative	
	Cumulative impacts: • Loss of vegetation • Loss of animal life • Establishment of alien	**Without Mitigation:** High Negative **With Mitigation:**	

Construction phase			
Activity	**Impact summary**	**Significance**	**Proposed mitigation**
	vegetation • Erosion	Low Negative	
Ablution Facilities	**Direct impacts:** • Pollution of surface water runoff • Pollution of soil	**Without Mitigation:** Medium Negative **With Mitigation:** Low Negative	• No open areas or the surrounding vegetation may be used as 'toilet facilities'. • Toilets should be available for all employees. Where waterborne sewerage is not available, the ECO must designate an area within the boundaries of the site for the erection of portable chemical toilets. • Toilet facilities shall occur at a minimum ration of 1 toilet per 15 employees. • Toilets shall be maintained in a hygienic state and serviced when required. • Temporary toilets should be serviced regularly and the contents be removed to a licensed disposal facility.
	Indirect impacts: • Pollution of surface water runoff • Pollution of soil • Pollution of groundwater • Odour • Unnatural enrichment of soil	**Without Mitigation:** Medium Negative **With Mitigation:** Low Negative	
	Cumulative impacts: • Pollution of surface water runoff • Pollution of soil • Pollution of groundwater • Odour • Unnatural enrichment of soil	**Without Mitigation:** High Negative **With Mitigation:** Low Negative	

Construction phase			
Activity	**Impact summary**	**Significance**	**Proposed mitigation**
Handling of waste / Waste Management (Note that waste refers to all construction debris and domestic waste generated due to construction activities.)	**Direct impacts:** • Spillage of material to be utilised during the construction phase as well as untreated sewage to the surrounding environment • Dumping of construction rubble and general waste on site	**Without Mitigation:** Medium-High Negative **With Mitigation:** Low Negative	• The contractor is responsible for the removal of construction waste. • Suitable containers (weather and vermin proof) will be placed on site to collect all solid waste. These will be emptied regularly. • No littering is permitted. During the construction and operational phase the site will be maintained in a neat and tidy condition. • All solid waste produced will be disposed of at an authorized landfill site. • No dumping, burning or burying of waste will be undertaken on site. • All hazardous waste will be disposed of at an authorized hazardous landfill site. • Recyclable hazardous waste will be re-used or sold to recycling contractors, where possible • A waste management plan will be compiled and designed to ensure that adequate waste management activities are undertaken. • Areas used for waste storage and loading of hazardous materials should be lined and
	Indirect impacts: • Surface and groundwater pollution due to spillage of potential hazardous substances such as untreated sewage from the temporary toilets and hydraulic material. • Impact on waterways (including the natural habitat of the area), including pollution.	**Without Mitigation:** Medium-High Negative **With Mitigation:** Low Negative	

Construction phase			
Activity	**Impact summary**	**Significance**	**Proposed mitigation**
	• Pollution of soil		bund walls have to be erected to contain any spills that might occur. • Waybills providing evidence of correct disposal procedure must be provided for the ECO's inspection. • Waste classification should be undertaken. • Visual inspections for the occurrence of pollution should be undertaken daily. • Spills should be cleaned up immediately according to best practices • DWS should be notified of any spillage / pollution of water sources (groundwater and / or surface water) within 24 hours of occurrence • Record should be kept on site to indicate date of visual inspection, any spillages observed, and manner in which spill was treated.
	Cumulative impacts: • Pollution of downstream watercourses • Pollution of soil • Pollution of groundwater • Air pollution	**Without Mitigation:** Medium - High Negative **With Mitigation:** Low Negative	
Health, safety, and security	**Direct impacts:** • Road safety at road crossings • Injuries on site • Health issues on site (for example, due to pollution)	**Without Mitigation:** Medium Negative **With Mitigation:** Low Negative	• Site should be fenced / marked with danger tape, where possible. • The contractors will comply with the Occupational Health and Safety Act, National Building Regulations and any other national, regional or local regulations with regard to safety on site.

Construction phase			
Activity	**Impact summary**	**Significance**	**Proposed mitigation**
	• Unauthorised entry		• Construction contracts will include safety and security measures for staff. • Precautions to ensure that construction staff and sites are visible and proper PPE will be provided to all employees. • Suitable warning and information signage should be available at the storage facilities. In addition, telephone numbers of emergency services (including local firefighting services) must be posted conspicuously on site. • Employees should be made aware of the health risks associated with any hazardous substances / dangerous goods used or stored on site. This includes soil that was contaminated with oil or diesel, etc. • Employees should receive relevant safety training in handling of hazardous substances / dangerous goods associated with the proposed project. • Construction work within road reserves will accommodate road users as far as possible. This includes the following: - Roads will be crossed in half widths at a time to minimise the impact on vehicular
	Indirect impacts: • Loss of vegetation and animal life due to possible fire outbreaks • Road safety issues at road crossings • Injuries on site • Health issues on site (for example, due to pollution) • Unauthorised entry	**Without Mitigation:** Medium Negative **With Mitigation:** Low Negative	
	Cumulative impacts: • Loss of vegetation and animal life due to possible fire outbreaks • Road safety issues at road crossings • Injuries on site • Health issues on site (for example, due to pollution) • Unauthorised entry	**Without Mitigation:** Medium Negative **With Mitigation:** Low Negative	

Construction phase			
Activity	**Impact summary**	**Significance**	**Proposed mitigation**
			traffic, where possible. - Construction along and across existing roads will be executed in such a manner that both pedestrian and vehicular traffic is accommodated at all times. - The contractor will be required to maintain adequate access to all public and private property at all times. - Contractor will supply, erect, and maintain road signs for all work areas conforming to the prescribed layout and requirement of the South African Road Traffic Signs Manual and other relevant notices. • Fire extinguishers will be available on site and in the construction camp (if any). • The contractor will be required to maintain adequate access to all public and private property at all times. • Speed limits of 20km/h will be enforced. • All relevant IAPs will be notified prior to any blasting activities • All relevant IAPs will be notified 24 hours prior to any known potential risks associated with the site and the activities

Construction phase			
Activity	**Impact summary**	**Significance**	**Proposed mitigation**
			to be undertaken on site. (For example, possible downstream flooding as a result of upstream diversion that are being removed.) • The necessary precautions with regard to road safety will be implemented for construction work within road crossings. • All injuries should be recorded.
Heritage	**Direct impacts:** • Harm to unknown heritage resources	**Without Mitigation:** High Negative **With Mitigation:** Low Negative	• In the case of the discovery of any heritage, archaeological or palaeontological significance, the work in the area will be stopped and reported to the archaeologist and SAHRA. Any construction activities in the nearby vicinity may only commence after approval is obtained from SAHRA as well as the ECO. • Known heritage resources (if any) must be avoided as far as possible. • Employees should be encouraged and informed of the need to be on the look-out for potential fossils / buried archaeological material. • In the case of the discovery of any stone tools or other archaeological or palaentological material, the work in the
	Indirect impacts: • Loss of heritage resources	**Without Mitigation:** High Negative **With Mitigation:** Low Negative	
	Cumulative impacts: • Loss of heritage resources	**Without Mitigation:** High Negative **With Mitigation:** Low Negative	

Construction phase			
Activity	**Impact summary**	**Significance**	**Proposed mitigation**
			immediate vicinity should temporarily cease and reported to the archaeologist and SAHRA. Should any human remains be exposed, the archaeologist as well as the local SAPS should be notified. • If any evidence of archaeological sites or remains (e.g. remnants of stone-made structures, indigenous ceramics, bones, stone artefacts, ostrich eggshell fragments, charcoal and ash concentrations), fossils or other categories of heritage resources are found during the proposed development, SAHRA APM Unit (Tel: 021 462 5402) must be alerted. • If unmarked human burials are uncovered, the SAHRA Burial Grounds and Graves (BGG) Unit (Thingahangwi Tshivhase/Ngqalabutho Madida 012 320 8490), must be alerted immediately as per section 36(6) of the NHRA • If heritage resources are uncovered during the course of the development, a professional archaeologist or palaeontologist, depending on the nature of the finds, must be contracted as soon as

Construction phase			
Activity	**Impact summary**	**Significance**	**Proposed mitigation**
			possible to inspect the heritage resource. If the newly discovered heritage resources prove to be of archaeological or palaeontological significance, a Phase 2 rescue operation may be required subject to permits issued by SAHRA • Appropriate measures should be undertaken by the ECO until the archaeologist / SAPS visits the site. This should include the following: • Site should be fenced with 'danger tape' • Position of finding should be recorded • Depth of finding should be recorded • Digital image of the finding should be taken • No information on the findings may be made public without the consent of the archaeologist / SAPS. • Construction activities in the area may only continue after approval from the archaeologist and SAHRA.area may only continue after approval from the archaeologist and SAHRA.
Noise and dust control	**Direct impacts:** • Elevation of noise levels	**Without Mitigation:** Medium Negative	• Construction activities will be limited to normal daytime hours, where possible

Construction phase			
Activity	**Impact summary**	**Significance**	**Proposed mitigation**
	• Generation of nuisance dust	**With Mitigation:** Low Negative	• Noise levels will be kept as low as possible during the construction phase in order not to disturb adjacent landowners • Proper mitigation measures will be implemented to limit noise (e.g. the installation of silencers, where required). • Proper mitigation measures will be implemented to limit the formation of dust (e.g. wetting of construction area, when required). • The speed of the construction vehicles will be limited to avoid dangerous conditions, the formation of dust and the excessive deterioration of roads being used.
	Indirect impacts: • Air pollution • Increase in noise levels outside of the proposed construction site may have a negative impact on surrounding landowners / occupants	**Without Mitigation:** Medium Negative **With Mitigation:** Low Negative	
	Cumulative impacts: • Air pollution • Increase in noise levels outside of the proposed construction site may have a negative impact on surrounding landowners / occupants	**Without Mitigation:** High Negative **With Mitigation:** Low Negative	
Handling and Storage of materials	**Direct impacts:** • Soil pollution • Air pollution • Fire outbreaks	**Without Mitigation:** High Negative **With Mitigation:**	• All chemicals used during the development, including fuel, will be stored in a proper storeroom or protected area to prevent pollution.

Construction phase			
Activity	**Impact summary**	**Significance**	**Proposed mitigation**
	• Surface water pollution • Injuries • Health issues	Low Negative	• Vehicles will be serviced at designated areas. No oil, diesel or other chemicals may be spilled or discharged anywhere. • Where applicable, the contractors will ensure that all relevant national, regional and local legislation regarding storage, transport, use and disposal of petroleum, chemical, harmful or hazardous substances and materials are adhered to, where necessary. • Cement and concrete mixing, if applicable, will only take place within the construction site. No concrete will be mixed directly on the ground. • All environmental problems occurring on the site such as chemical spillage, wasteful water disposal, etc. will be reported to the ECO. The ECO should implement best practices to rectify the impacts thereof on the environment. • Spill response equipment must be available during the handling and loading of hazardous waste (if any). • Hazardous substances such as fuel to be stored in above ground tanks are to be
	Indirect impacts: • Loss of vegetation and animal life due to fire outbreaks • Soil pollution • Air pollution • Surface and groundwater pollution • Injuries • Health issues	**Without Mitigation:** High Negative **With Mitigation:** Low Negative	
	Cumulative impacts: • Loss of vegetation and animal life due to fire outbreaks • Soil pollution • Air pollution • Surface and groundwater pollution • Injuries • Health issues	**Without Mitigation:** High Negative **With Mitigation:** Low Negative	

Construction phase			
Activity	**Impact summary**	**Significance**	**Proposed mitigation**
			stored in bunded areas. • Bund walls will have a capacity of at least 110% of the total capacity of the stored volume. • No oil, diesel or other chemicals may be spilled or discharged anywhere and contact with bare soil should be avoided at all costs. • Drip trays will be used during the servicing of vehicles as well as the transfer of chemicals / substances from transportation vehicles. • A monitoring system should be implemented to determine the occurrence (if any) of any fuel / oil spillages / untreated sewer. • The necessary mitigation measures should be implemented immediately, should any leakages / spills be detected. • Material stockpiles, such as bricks and pipes, must be stable and well secured to avoid collapse and possible injury • Material and Safety Data Sheets (MSDSs) should be readily available on site for all hazardous materials. MSDSs should

Construction phase			
Activity	**Impact summary**	**Significance**	**Proposed mitigation**
			additionally include information on ecological impacts and measures to minimise negative environmental impacts during accidental releases or escapes. • Storage areas should be kept clean and free from any accumulation of combustible matter (such as paper) and any possible source of ignition should be removed.
Hazardous waste management	**Direct impacts:** • Soil pollution • Air pollution • Fire outbreaks • Surface water pollution • Injuries • Health issues		• Hazardous wastes must be separated from general wastes, stored within secondary containment in appropriate containers. • Proper storage facilities for the storage of hazardous / dangerous goods must be provided to prevent the migration of spillage into the soil and or groundwater. • Certificates / waybills of hazardous waste disposals are to be available on request as well as auditing purposes. This includes the removal of soil contaminated with hydrocarbons. • Storage of hazardous substances and refuelling areas are to be bunded with an impermeable liner to protect groundwater quality and must comply with the relevant
	Indirect impacts: • Loss of vegetation and animal life due to fire outbreaks • Soil pollution • Air pollution • Surface and groundwater pollution • Injuries	**Without Mitigation:** High Negative **With Mitigation:** Low Negative	

Construction phase			
Activity	**Impact summary**	**Significance**	**Proposed mitigation**
	• Health issues		SANS codes. • Areas used for the storage of hazardous materials are to be clearly indicated as such.
	Cumulative impacts: • Loss of vegetation and animal life due to fire outbreaks • Soil pollution • Air pollution • Surface and groundwater pollution • Injuries • Health issues	**Without Mitigation:** High Negative **With Mitigation:** Low Negative	
Hazardous and Flammable materials: Delivery	**Direct impacts:** • Soil pollution • Air pollution • Fire outbreaks • Surface water pollution • Injuries • Health issues	**Without Mitigation:** High Negative **With Mitigation:** Low Negative	• All deliveries (especially of hazardous nature) must be supervised. • Subcontractors and delivery companies should be informed of the delivery procedures and made aware of restrictions as to where materials may be stored. • Loads must be secured to prevent spillage during transportation thereof. • Hazardous substances are to be transported in sealed drums or bags
	Indirect impacts: • Loss of vegetation and animal life due to fire outbreaks • Soil pollution • Air pollution • Surface and	**Without Mitigation:** High Negative **With Mitigation:** Low Negative	

Construction phase			
Activity	**Impact summary**	**Significance**	**Proposed mitigation**
	groundwater pollution • Injuries • Health issues		
	Cumulative impacts: • Loss of vegetation and animal life due to fire outbreaks • Soil pollution • Air pollution • Surface and groundwater pollution • Injuries • Health issues	**Without Mitigation:** High Negative **With Mitigation:** Low Negative	
Hazardous and Flammable materials: Cement and / or concrete mixing	**Direct impacts:** • Soil pollution • Air pollution • Fire outbreaks • Surface water pollution • Injuries • Health issues	**Without Mitigation:** High Negative **With Mitigation:** Low Negative	• Limit cement and concrete mixing to single sites, where possible. • No mixing allowed directly onto the ground. • All visible remains of excess material will be treated as hazardous waste. • Solid concrete waste may be treated as inert construction rubble. However, wet cement and liquid slurry and cement powder must be treated as hazardous waste
	Indirect impacts: • Loss of vegetation and animal life due to fire outbreaks • Soil pollution	**Without Mitigation:** High Negative **With Mitigation:** Low Negative	

Construction phase			
Activity	**Impact summary**	**Significance**	**Proposed mitigation**
	• Air pollution • Surface and groundwater pollution • Injuries • Health issues		
	Cumulative impacts: • Loss of vegetation and animal life due to fire outbreaks • Soil pollution • Air pollution • Surface and groundwater pollution • Injuries • Health issues	**Without Mitigation:** High Negative **With Mitigation:** Low Negative	
Hazardous and Flammable materials: Gas Storage	**Direct impacts:** • Air pollution • Fire outbreaks • Injuries • Health issues	**Without Mitigation:** High Negative **With Mitigation:** Low Negative	• All combustible materials are to be store at least 3 m from any gas storage areas. In case of any flammable or any other gas storage areas, open flames, welding and cutting operations, smoking, etc. shall be prohibited in or near the storage area. • No gas will be delivered until the site is registered with local Fire Safety. • Cylinders should always be stored in a well-ventilated area away from spark, flames or
	Indirect impacts: • Air pollution • Fire outbreaks • Injuries • Health issues	**Without Mitigation:** High Negative **With Mitigation:** Low Negative	

Construction phase			
Activity	**Impact summary**	**Significance**	**Proposed mitigation**
	Cumulative impacts: • Air pollution • Fire outbreaks • Injuries • Health issues	**Without Mitigation:** High Negative **With Mitigation:** Low Negative	any source of heat or ignition. • Cylinders should always be handled, stored, used, and transported in an upright position. It should not be dropped, dragged, or rolled on their sides or allowed to skid. Cylinders that are too large to be carried shall be tilted and rolled on the rims of their foot rings or bases. • Valves should be kept properly closed.
Hazardous and Flammable materials: Chemicals, Grease and Oil Storage	**Direct impacts:** • Soil pollution • Fire outbreaks • Surface water pollution • Injuries • Health issues	**Without Mitigation:** High Negative **With Mitigation:** Low Negative	• Storage areas must be bunded and hard surfaced in order to protect groundwater quality. • Compliance with SANS codes and hazardous substances bylaws should be adhered to. • All lids must be properly sealed / closed to prevent Volatile Organic Compounds (VOCs) and other potentially harmful gaseous compounds from escaping.
	Indirect impacts: • Loss of vegetation and animal life due to fire outbreaks • Soil pollution • Surface and groundwater pollution • Injuries • Health issues	**Without Mitigation:** High Negative **With Mitigation:** Low Negative	
	Cumulative impacts:	**Without Mitigation:**	

Construction phase			
Activity	**Impact summary**	**Significance**	**Proposed mitigation**
	• Loss of vegetation and animal life due to fire outbreaks • Soil pollution • Surface and groundwater pollution • Injuries • Health issues	High Negative **With Mitigation:** Low Negative	
Hazardous and Flammable materials: Hydrocarbon spillages	**Direct impacts:** • Fire outbreaks • Surface water pollution • Injuries • Health issues	**Without Mitigation:** High Negative **With Mitigation:** Low Negative	• Spill kits are to be made permanently available at areas which have the potential to be subjected to spillage of hazardous substances and dangerous goods. • Remediation of spillages must be conducted immediately and closed out within 24 hours. • No waste water or waste will be disposed of into the surrounding environment at any time. Water collected in bunded areas must be collected in containers and disposed of as hazardous waste. • Machinery will be kept maintained in line with manufactures specifications to minimise the risk of hydrocarbon spillages. • An incident reporting system will be
	Indirect impacts: • Loss of vegetation and animal life due to fire outbreaks • Soil pollution • Surface and groundwater pollution • Injuries • Health issues	**Without Mitigation:** High Negative **With Mitigation:** Low Negative	
	Cumulative impacts: • Loss of vegetation and animal life due to fire	**Without Mitigation:** High Negative	

Construction phase			
Activity	**Impact summary**	**Significance**	**Proposed mitigation**
	outbreaks • Soil pollution • Surface and groundwater pollution • Injuries • Health issues	**With Mitigation:** Low Negative	implemented in order to ensure incidents, where spillages has occurred, are closed out and appropriate measures are taken to prevent further incidents. • Incidents must be reported to DWS within 24 hours. • Contaminated soil must be disposed of in a hazardous materials skip and removed to a licensed hazardous landfill facility by a licensed contractor.

Operational phase			
Activity	**Impact summary**	**Significance**	**Proposed mitigation**
This phase consists of the use of the abstraction works. Maintenance and repair will be undertaken on the infrastructure when necessary.	**Direct impacts:** • Deterioration of the infrastructure in the long term.	**Without Mitigation:** Medium – Low Negative **With Mitigation:** Low Negative	• Maintenance and repair will be undertaken on the infrastructure when necessary. • Soil erosion occurrences will be attended to immediately. • Establishment of alien vegetation will be monitored and alien species will be removed by hand or by an approved chemical before gestation thereof.
	Indirect impacts: • Establishment of alien / invader species due to previous disturbance will also be associated with this phase. • Increase in noise levels during maintenance. • Erosion	**Without Mitigation:** Medium – Low Negative **With Mitigation:** Low Negative	
	Cumulative impacts: • Establishment of alien / invader species due to previous disturbance will also be associated with this phase. • Increase in noise levels during maintenance. • Erosion	**Without Mitigation:** Medium – Low Negative **With Mitigation:** Low Negative	

Operational phase			
Activity	**Impact summary**	**Significance**	**Proposed mitigation**
	• Surface and groundwater pollution		

Decommissioning phase			
Activity	**Impact summary**	**Significance**	**Proposed mitigation**
It is not anticipated that the proposed project will cease in the nearby future. However, if decommissioning is decided upon, a rehabilitation plan will be developed and submitted for approval. The end-use of the area will be kept in mind during the compilation of the rehabilitation plan. Activities associated with the decommissioning phase will be limited to the rehabilitation of areas disturbed during the construction phase. All disturbed areas will be	**Direct impacts:** • Rehabilitation of disturbed area • Re-vegetation • Limit occurrence of erosion • Proper stormwater control • No ponding on site • Limit visual impact	**Without Mitigation:** Medium Positive **With Mitigation:** High Positive	• Temporary structures and office sites (if any) will be dismantled and removed after completion of the construction phase of the project. • All waste, equipment, materials, etc. used during construction will be cleared from the site. The contractors will ensure that the site is cleared and rehabilitated to the satisfaction of the ECO. • An alien plant control and monitoring programme will be implemented. • The establishment of natural occurring vegetation will be encouraged at disturbed areas. • Re-vegetation of disturbed areas will be undertaken with site indigenous species. • Hydro-seeding will be implemented if the establishment of natural occurring vegetation does not occur within reasonable time. • Temporary concrete surfaces (if any) will be removed, and compacted areas ripped. • Establishment of extensive alien species will be monitored.
	Indirect impacts: • Rehabilitation of disturbed area	**Without Mitigation:** Medium Positive **With Mitigation:** High Positive	
	Cumulative impacts: • Rehabilitation of disturbed area	**Without Mitigation:** Medium Positive **With Mitigation:** High Positive	

Decommissioning phase			
Activity	**Impact summary**	**Significance**	**Proposed mitigation**
rehabilitated according to best practices. A rehabilitation plan will be developed, if it is decided to decommission the abstraction works and associated infrastructure before the cessation of the operation aspects of the said project. The rehabilitation plan will include management and mitigation measures to be implemented during the decommissioning of the project			

No-go Option			
Activity	**Impact summary**	**Significance**	**Proposed mitigation**
Keeping the status quo - No construction activities associated with a new abstraction works.	**Direct impacts:** • No direct environmental impacts.	**Without Mitigation:** N/A **With Mitigation:** N/A	• The municipality will have to use trucks to transport potable water from adjacent towns. However, this option will largely depend on the availability of employees and suitable trucks. In addition, the adjacent towns do not have enough potable water to provide Senekal with their required volumes of water on a daily basis. Therefore, this option is not seen as a feasible option.
	Indirect impacts: • The applicant will not be able to provide Senekal with sufficient potable water	**Without Mitigation:** High Negative **With Mitigation:** High Negative	
	Cumulative impacts: • This will lead to negative economic and environmental impacts	**Without Mitigation:** High Negative **With Mitigation:** High Negative	

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

2. ENVIRONMENTAL IMPACT STATEMENT

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

Please refer to Annexure F for a copy of the Impact Assessment Report.

Environmental impact statement for the proposed construction of a new abstraction works as part of the Bulk Water Supply Scheme, Senekal			
Alternative 1 Preferred			
Nr	**Impact / Activity**	**Without Mitigation**	**With Mitigation**
1	Disturbance of sediment and Loss of soil Disturbance of sediment will remove riparian vegetation and disturbance of the soil surface which will result in destabilisation of the riverbed and increase the downstream sediment load. Increased establishment of exotic weeds and invaders due to disturbance caused by dredging is also probable.	High Negative	Medium
2	Construction of access road, where necessary Construction of an access road across the floodplain and the banks of the river will also cause disturbance although on a local scale. The road will require the removal of riparian vegetation. Increased erosion, sediment load and exotic weed establishment is also likely.	High Negative	Low
3	Vegetation Destruction Impacts on vegetation and listed or protected plant species resulting from the construction phase	High Negative	Medium-Low Negative
4	Impacts on animal species resulting from construction activities No animals may be captured / harmed / killed on site. Specialists should be appointed to remove / translocate species, if required. The necessary permits should also be obtained. Any occurrences of harmed animals should be	Medium-Low Negative	Low Negative

	reported to the ECO, the required steps should be taken and should be recorded as such.		
5	Erosion Proper erosion mitigation measures should be implemented. Visual inspections should be undertaken at least every 6 months to investigate the occurrence of sedimentation and erosion.	High Negative	Low Negative
6	Pollution Control Maintenance and repair will be undertaken when necessary. All temporary infrastructure related to the construction phase will be removed from site. Temporary concrete surfaces (if any) will be removed and compacted areas rehabilitated according to Best Practices. No waste will be dumped on site and any waste occurring on site will be removed and disposed of according to best practices.	High Negative	Low Negative
7	Health and Safety Site should be fenced / marked with danger tape, where possible. The contractors will comply with the Occupational Health and Safety Act, National Building Regulations and any other national, regional or local regulations with regard to safety on site.	Medium Negative	Low Negative
8	Heritage, including archaeological & paleontological In the case of the discovery of any heritage, archaeological or palaeontological significance, the work in the area will be stopped and reported to the archaeologist and SAHRA. Any construction activities in the nearby vicinity may only commence after approval is obtained from SAHRA as well as the ECO.	Medium-Low Negative	Low Negative
9	Visual and noise The site should be kept clean and tidy. Construction activities should be undertaken during normal day hours, where possible.	Medium Negative	Medium-Low Negative
10	Surface Water Disturbed waterways should be rehabilitated according to best practices. All polluted areas should be cleaned as soon as possible. Waste to be removed from site.	High Negative	Medium Negative

Alternative 1Preferred

The same as above, including:
The expected environmental impacts relating to the proposed project are mostly temporary (during the construction phase) and the mitigation measures referred to in the current document, the EMPr, Specialist Reports as well as Best Practices will ensure that the disturbance is kept to a minimum and ensure that adequate rehabilitation takes place.

No-go alternative (compulsory)

The no-go alternative is not seen as a reasonable / feasible alternative as this will place the Local Municipality in such a position that it will not be able to provide Senekal with sufficient volume of potable water, resulting in a possible water shortage and water restrictions on a regular basis.

As the project is described as a basic service, the lack thereof will lead to major social and economic impacts that will indirectly cause severe environmental concerns. The impacts expected during the construction phase of the proposed project can be minimised through the recommended mitigation measures and therefore the no-go alternative is not ideal.

SECTION E. RECOMMENDATION OF PRACTITIONER

Is the information contained in this report and the documentation attached hereto sufficient to make a decision in respect of the activity applied for (in the view of the environmental assessment practitioner)?	YES	

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

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

Refer to the EMPr in Appendix F for recommended mitigation measures.

Is an EMPr attached?	YES	

The EMPr must be attached as Appendix G.

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

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

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

Neil Devenish
NAME OF EAP

SIGNATURE OF EAP

28 June 2022
DATE

SECTION F: APPENDIXES

The following appendixes must be attached:

Appendix A: Maps

Appendix B: Photographs

Appendix C: Facility illustration(s)

Appendix D: Specialist reports
Appendix D_1: Heritage
Appendix D_2: Ecological
Appendix D_3: Preliminary Design Report

Appendix E: Public Participation
Appendix E_1: List of identified possible IAPs
Appendix E_2: Proof of notification
Appendix E_3: List of registered parties
Appendix E_4: List of comments received
Appendix E_5: Response to comments received
Appendix E_6: Proof of dBAR to registered parties

Appendix F: Impact Assessment

Appendix G: Environmental Management Programme

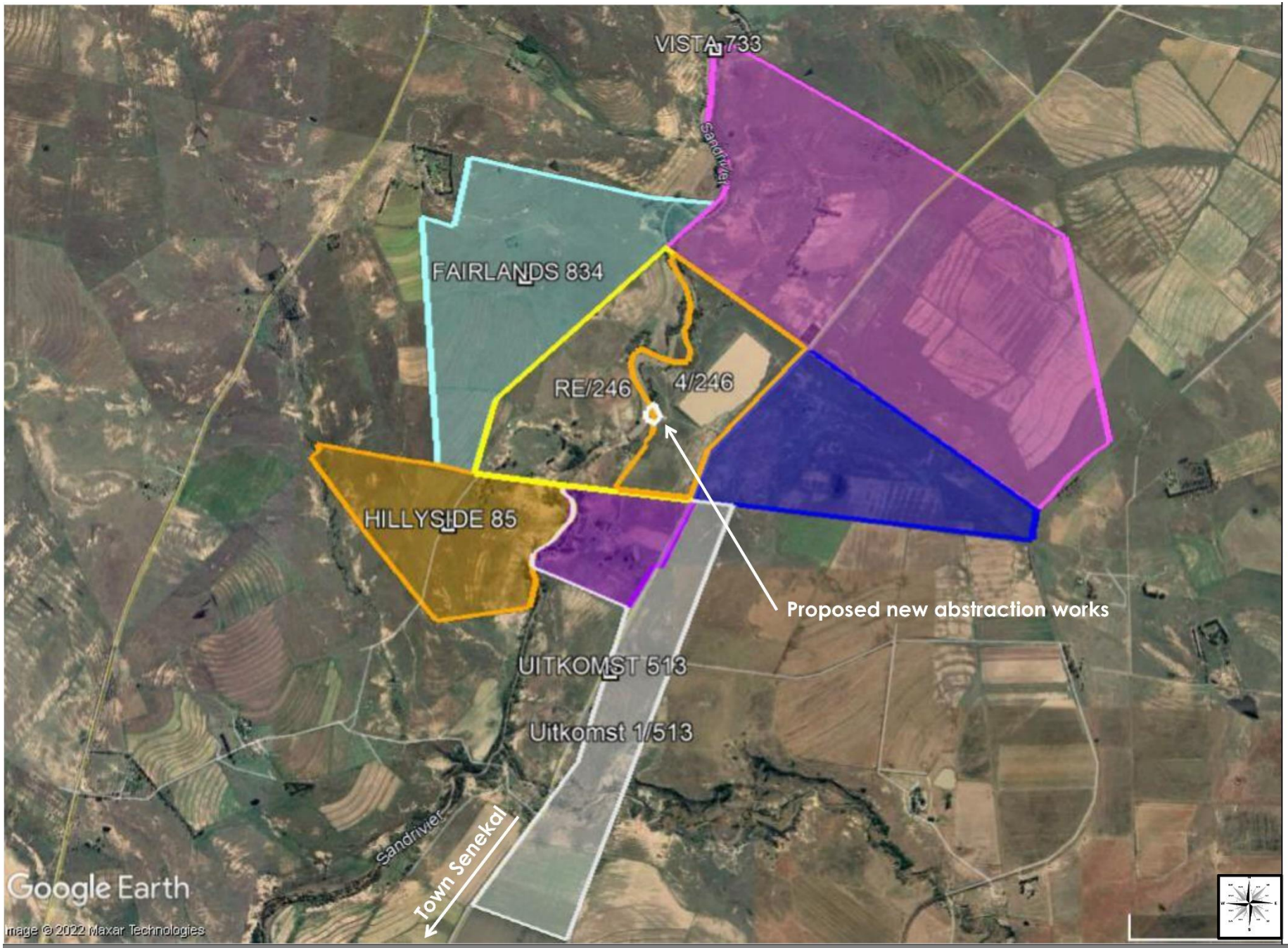
Appendix H: Details of EAP and expertise
Declaration by EAP

Appendix I: Specialist's declaration of interest
Heritage
Ecological

Appendix J: Additional Information
Appendix J_1: Confirmation from Municipality
Appendix J_2: Title Deed Document

APPENDIX A

Maps



Legend:

- Remainder of the farm Zyfer Fontein 246
- Portion 4 of the farm Zyfer Fontein 246

Coordinates:

A: 28°14'29.53"S; 27°39'21.26"E
B: 28°14'28.06"S; 27°39'23.68"E
C: 28°14'29.12"S; 27°39'25.34"E
D: 28°14'30.01"S; 27°39'25.32"E
E: 28°14'32.34"S; 27°39'24.34"E
F: 28°14'31.87"S; 27°39'21.40"E

1 km

TYPE OF PLAN: LOCALITY PLAN

mda Town & Regional Planners, Environmental & Development Consultants
T: 051 447 1583 | P.O. Box 20298, Willows, Bloemfontein, 9320
F: 086 455 2568 | 9 Barnes Street, Westdene, Bloemfontein, 9301

PROJECT:
THE PROPOSED CONSTRUCTION OF A NEW ABSTRACTION WORKS, SAND RIVER, SENEKAL

PROJECT BY:
SETSOTO LOCAL MUNICIPALITY

DRAWN BY:
HS

Legend:

Construction site: Proposed new abstraction works

Coordinates:

A: 28°14'29.53"S; 27°39'21.26"E
B: 28°14'28.06"S; 27°39'23.68"E
C: 28°14'29.12"S; 27°39'25.34"E
D: 28°14'30.01"S; 27°39'25.32"E
E: 28°14'32.34"S; 27°39'24.34"E
F: 28°14'31.87"S; 27°39'21.40"E

100 m

TYPE OF PLAN: LOCALITY PLAN

mda
Town & Regional Planners, Environmental & Development Consultants
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PROJECT:
THE PROPOSED CONSTRUCTION OF A NEW ABSTRACTION WORKS, SAND RIVER, SENEKAL

PROJECT BY:
SETSOTO LOCAL MUNICIPALITY

DRAWN BY:
HS

APPENDIX B

Photographs

Figure 1: View of the proposed location of the abstraction works. Existing infrastructure is visible and causes some disturbance though the area is clearly still dominated by natural vegetation.

Figure 2: General view of the surrounding area with a gently sloping topography and natural grassland. The located of the Sand River is indicated in the background.

Figure 3: The existing Cyferfontein Dam does cause significant transformation of the area.

Figure 4: Structures and infrastructure associated with the dam also contribute toward disturbance. Note exotic weeds in foreground (*Verbena tenuisecta*).

Figure 5: Despite the general disturbance of the area, natural grassland and elements of conservation value does also still remain in the area.

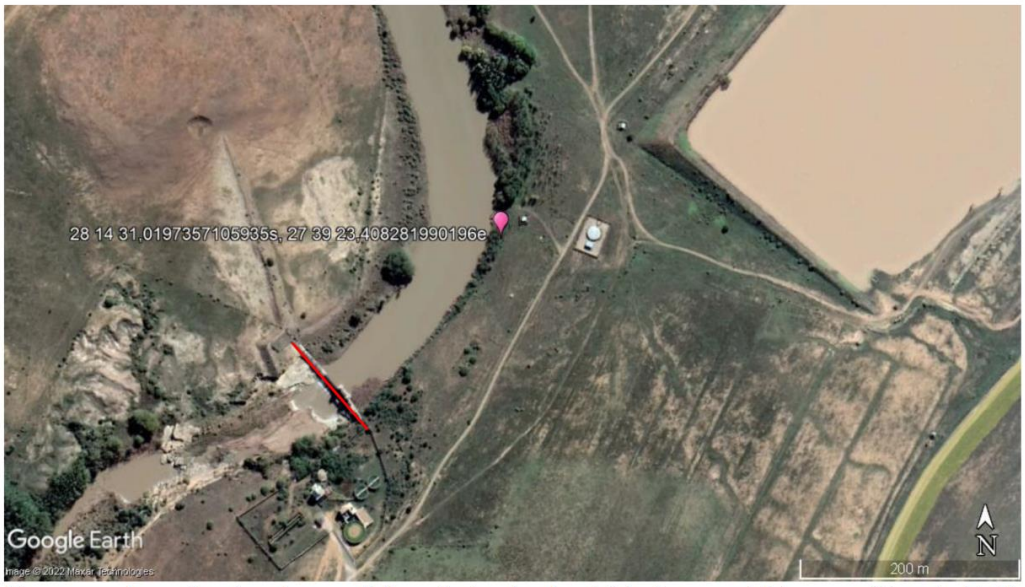


Figure 6: Impacts at and around the site is clearly visible from aerial images (Google Earth 2021). The weir (red) as well as WTW and off-channel Cyferfontein Dam is evident.

Figure 7: The downstream weir (red) and WTW has a significant impact on the river at the site.

Figure 8: The weir clearly results in an elevation of the baseflow level of the river. The banks would naturally have been much broader and more diverse in terms of habitat and geomorphology.

APPENDIX C

Facility Illustration(s)

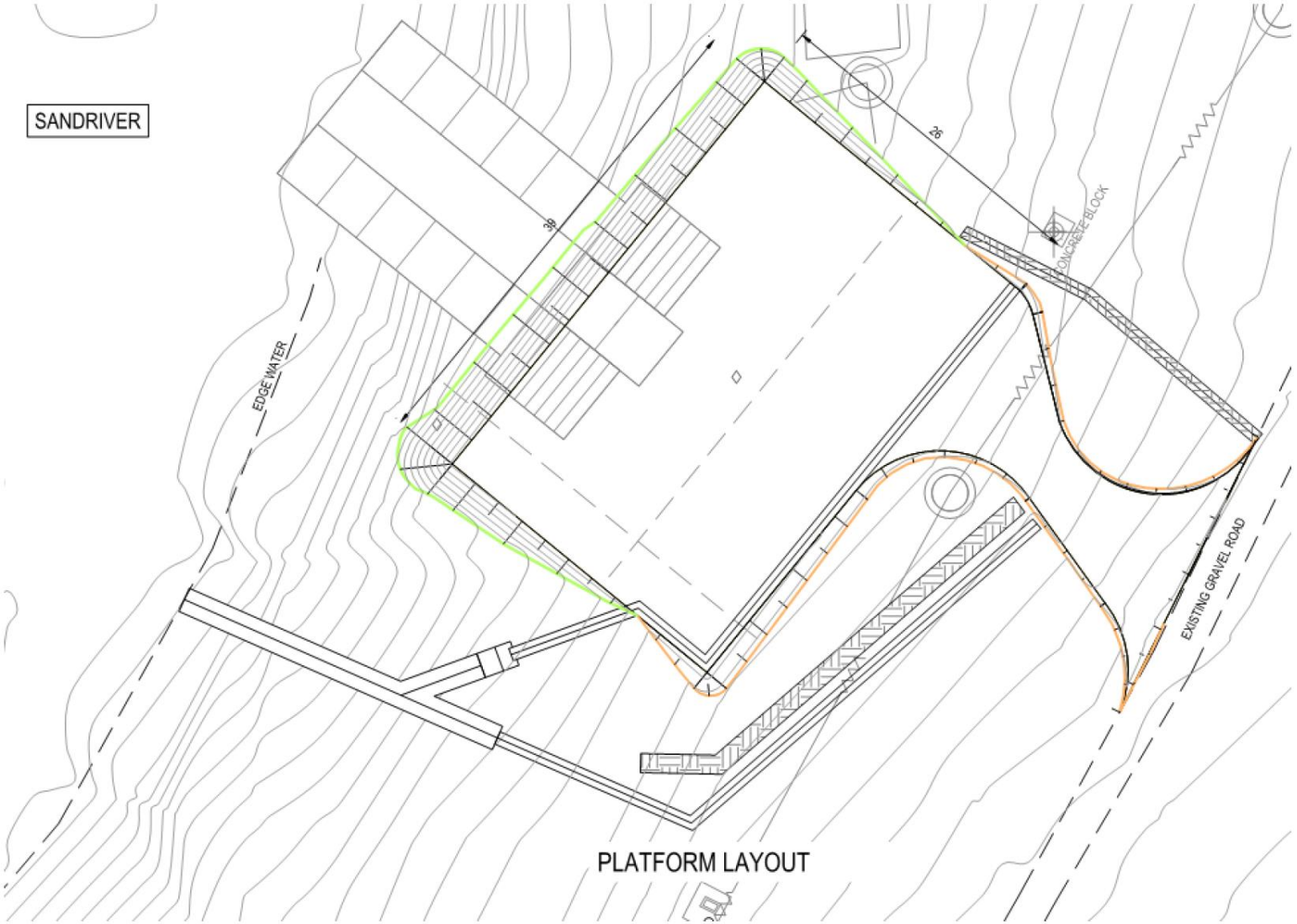
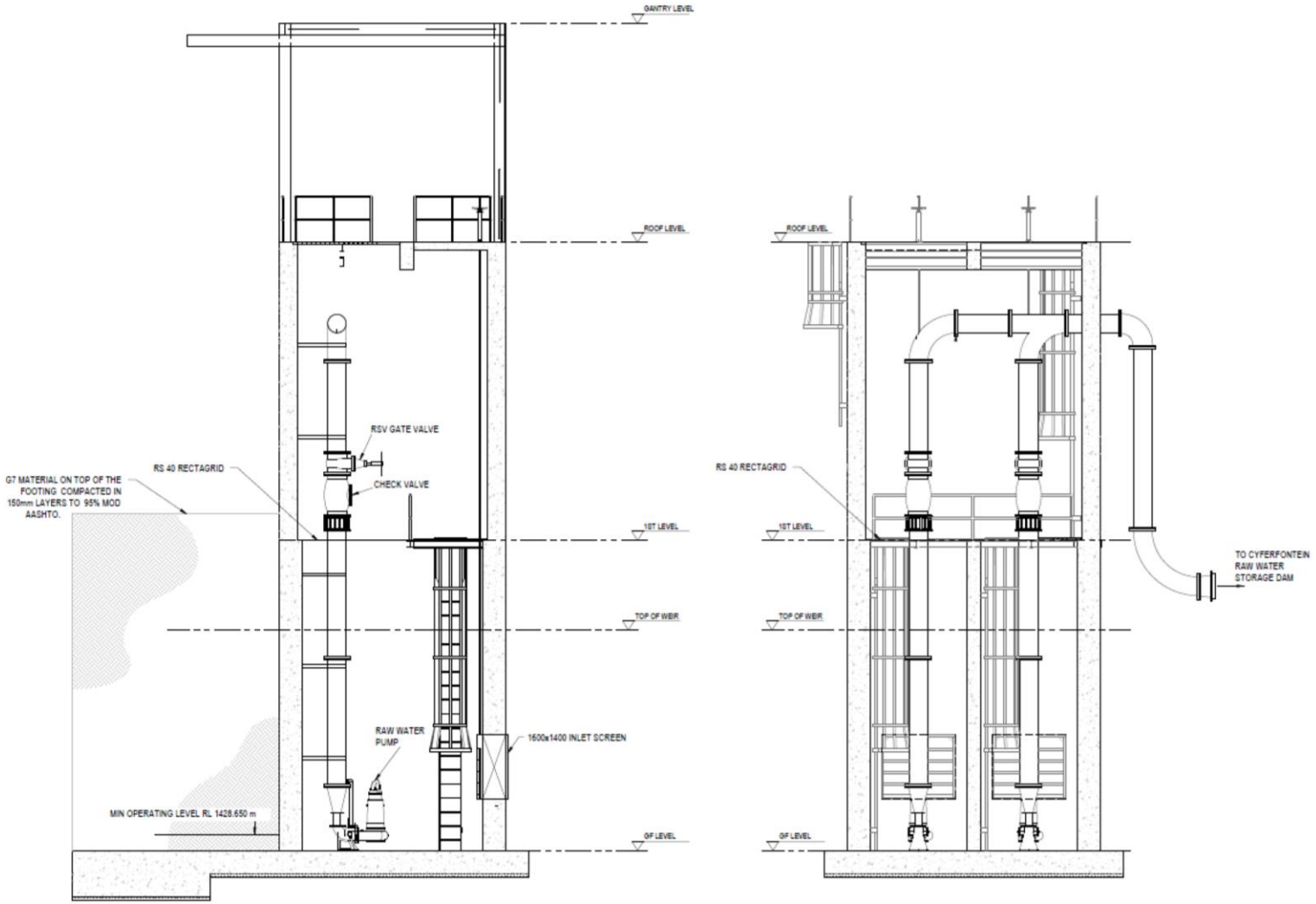


Figure 3 Sand River Abstraction Access Platform



SAND RIVER
ABSTRACTION PUMP STATION
FRONT AND SIDE VIEW

Figure 4 Front and Side View River Abstraction Pump Station

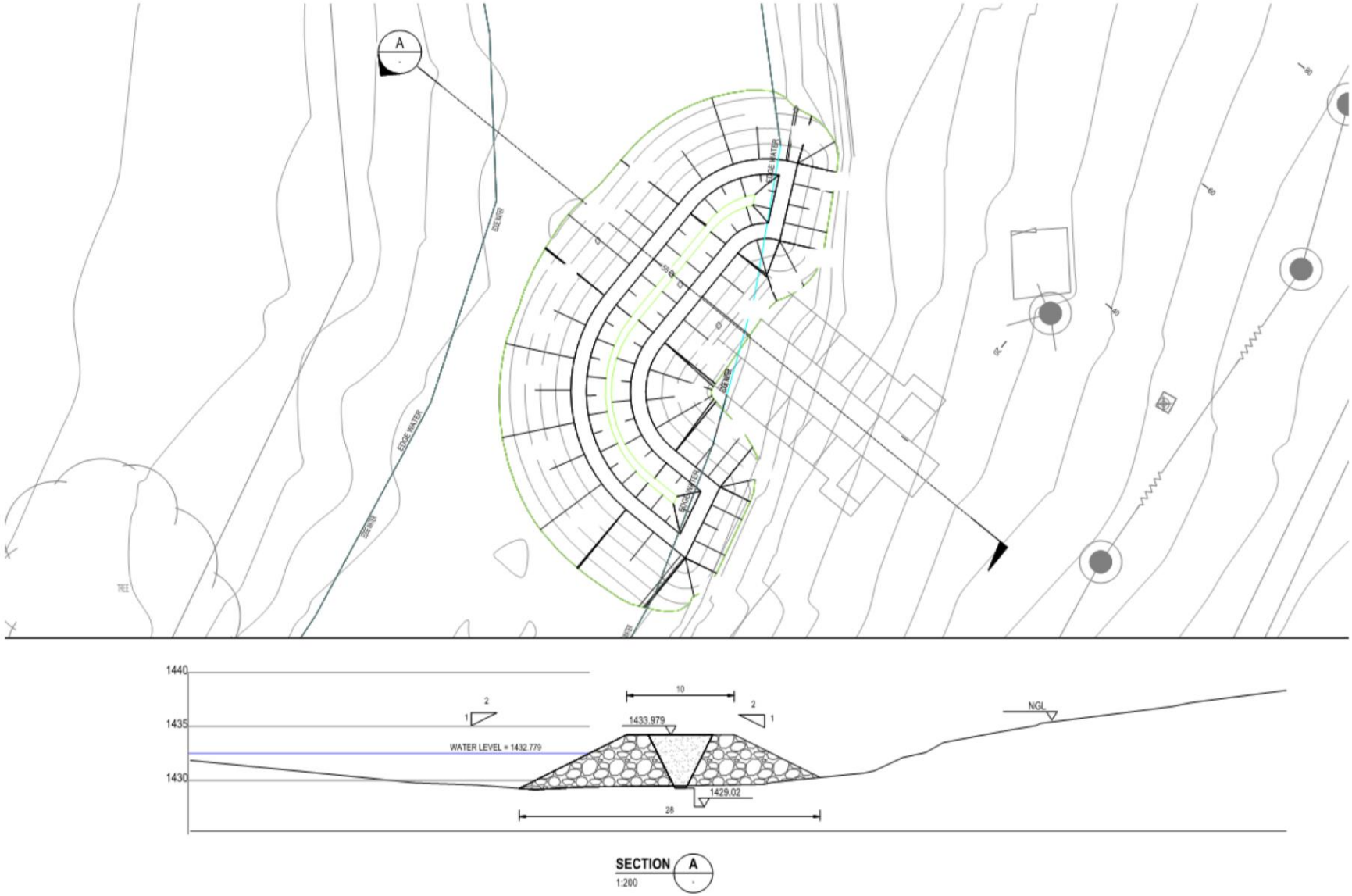


Figure 5 Coffer Dam Layout and Sections

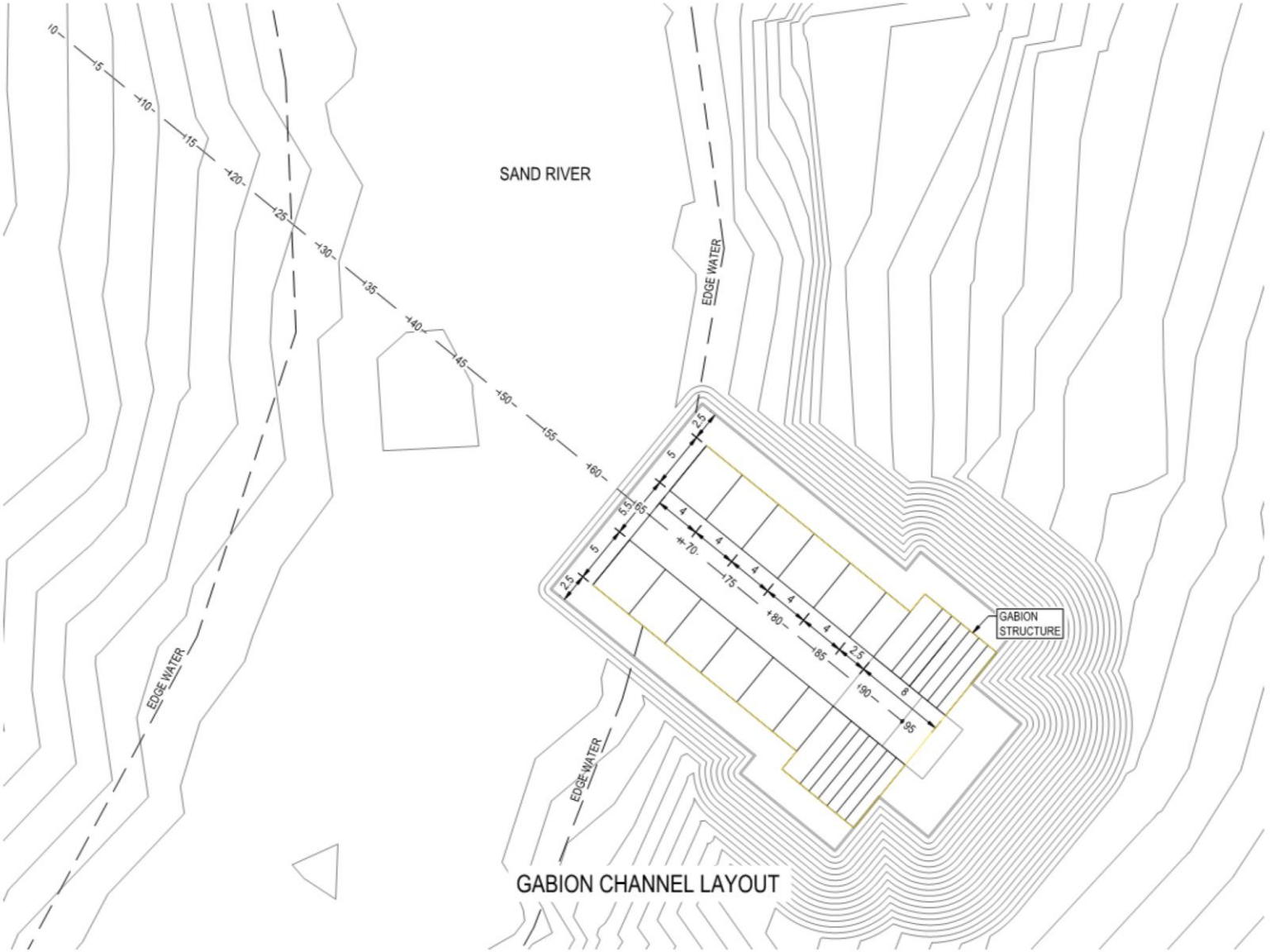
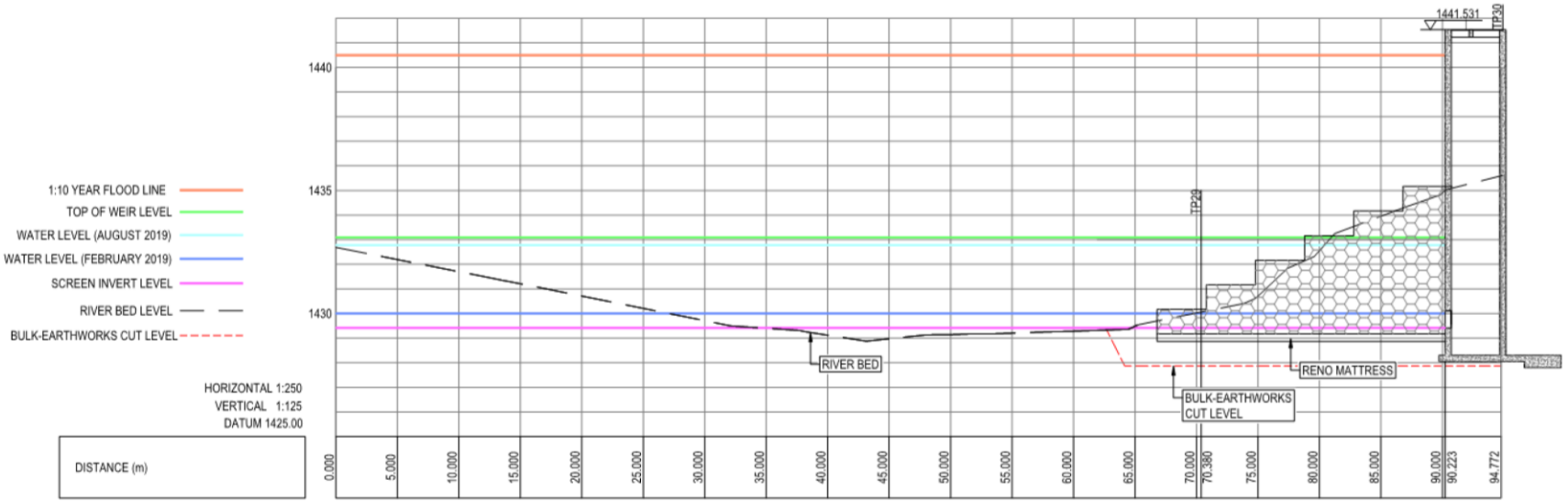


Figure 6 Plan View River Abstration Channel Pump Stationt



GABION CHANNEL LAYOUT

Figure 7 Sectional View of River Abstraction Pump Station

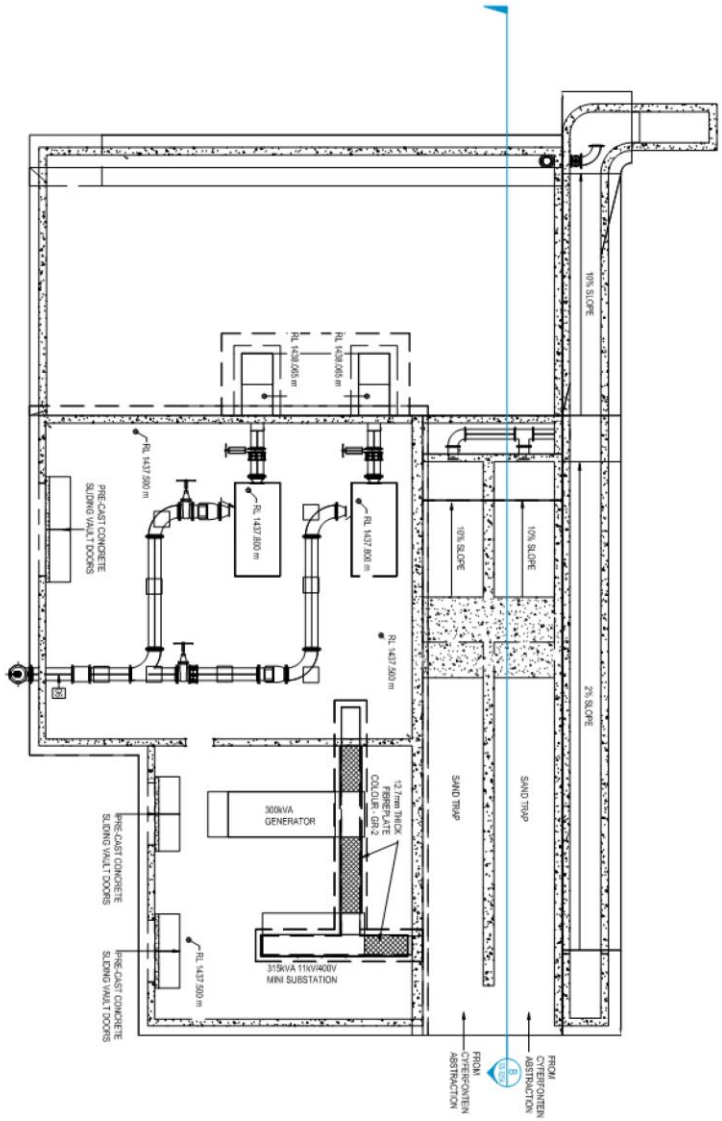


Figure 13 Plan View of Booster Pump Station Design

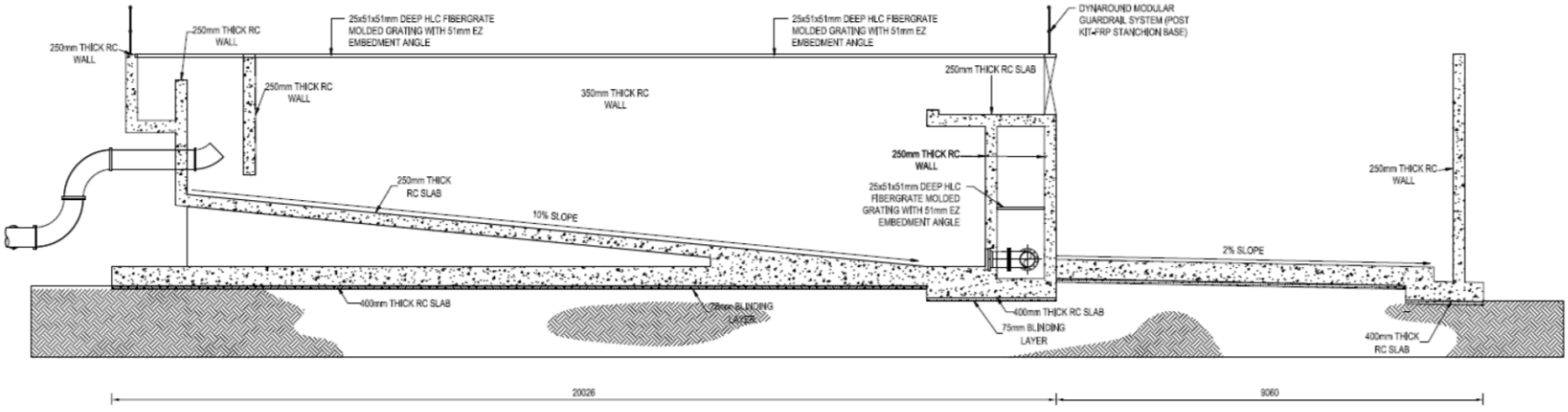


Figure 14 Section View of Booster Pump Station Design

APPENDIX D

Specialist Reports

APPENDIX D_1

Heritage Report

Heritage Impact Assessment for proposed construction of a new water abstraction facility at the Cyferfontein Dam near Senekal, Setsotso Local Municipality, FS Province.

Palaeo Field Sevices
PO Box 38806
Langenhovenpark
9330
March 2022

Summary

A phase 1 Heritage Impact assessment was conducted for a proposed a new water abstraction facility with a ~1.15 ha footprint, at the Cyferfontein Dam near Senekal, FS Province. The proposed abstraction area footprint is made up of flatland and riparian terrain, located on the Sand River, approximately 250 m north of an existing waterworks facility and about 90 m due south of the Cyferfontein Dam. The site has been degraded by previous construction activities related to the building of Cyferfontein Dam and nearby waterworks facility. There are no indications of Stone Age artifacts, prehistoric structures, graves or rock engravings within the footprint. The site is underlain by geologically recent (cf. late Holocene) alluvium associated with adjacent Sand River overburden. There is no evidence for the accumulation and preservation of intact fossil material within these late Quaternary sediments. Fine- to medium-grained Adelaide Subgroup sandstone and Jurassic-age dolerite are outcropping along high ground to the east and south of the footprint, respectively. Potential for palaeontological impact is considered low given age of the unconsolidated sediments underlying the proposed footprint. The latter sediments, also appear to cap a dolerite knick, point intersecting the river. The proposed development footprint is not considered archaeologically vulnerable. There are no major archaeological grounds to suspend the proposed development, provided that all excavation activities are confined to within the confines of the development footprint. The study area is considered to be of low archaeological significance and is assigned a site rating of Generally Protected C.

Introduction

A phase 1 Heritage Impact assessment was conducted for a proposed a new water abstraction facility with a ~1.15 ha footprint, at the Cyferfontein Dam near Senekal, FS Province (**Fig. 1**). Raw water will be abstracted from the Sand River to the Cyferfontein Dam north of Senekal/Matwabeng, and transported via a new raw water booster pump station to a centralized water treatment works in Senekal.

The extent of the proposed development (over 5000 m2) falls within the requirements for a Heritage Impact Assessment (HIA) as required by Section 38 (Heritage Resources Management) of the South African National Heritage Resources Act (Act No. 25 of 1999). The site visit and subsequent assessment took place in November 2013. The task involved identification of possible archaeological and paleontological sites or occurrences in the proposed zone, an assessment of their significance, possible impact by the proposed development and recommendations for mitigation where relevant.

Methodology

The palaeontological and archaeological significance of the affected area was evaluated through a desktop study and carried out on the basis of existing field data, database information, published literature and maps. This was followed up with a field assessment by means of a pedestrian survey and investigation of all exposed sections within the footprint. A Garmin Etrex Vista GPS hand model (set to the WGS 84 map datum) and a digital camera were used for recording purposes.

Site significance classification standards prescribed by SAHRA (2005) were used to indicate overall significance and mitigation procedures where relevant (**Table 1**).

Site Information

Maps: 1:50 000 topographical 2827BC Senekal

1:250 000 geological map 2826 Winburg

Site Coordinates (**Fig 2**).

A) 28°14'29.11"S 27°39'23.37"E
B) 28°14'30.98"S 27°39'27.95"E
C) 28°14'33.51"S 27°39'26.71"E
D) 28°14'32.03"S 27°39'22.75"E

The proposed abstraction area footprint covers a 1.15 ha area made up of flatland and riparian terrain, located on the Sand River, approximately 250 m north of an existing waterworks facility and about 90 m due south of the Cyferfontein Dam **(Fig. 2**).

Background

Geology

The geology of the region has been described by Nolte (1995). The Senekal area is primarily underlain by light-coloured, fine to coarse-grained sandstone and blue-grey mudstone of the Adelaide Subgroup (*Pa,* Beaufort Group, Karoo Supergroup) (**Fig. 3**). Dolerite (*Jd*), in the form of dykes and sills are common but not palaeontologically significant, being part of an interconnected network of igneous dolerite intrusions. These dykes intruded the local environment during the Jurassic and "cooked" the adjacent sedimentary rocks (metasediments). This had the effect of hardening the rocks and destroying any fossil plant material or physically destroying neighboring vertebrate fossils.

Potential Heritage

The following (pre- site visit) introduction provides a brief overview of potential palaeontological and archaeological heritage resources previously recorded in the region, which are likely, but not certain to occur within the proposed development footprint .

Palaeontology

Possible occurrences: fossil bearing Karoo Supergroup sandstones and intercalated mudstone, fossil-bearing, late Quaternary alluvium associated with large river systems.

The Karoo sedimentological strata underlying the proposed pipeline route and surrounding area are generally accepted to be Late Permian in age, and are assigned to the *Dicynodon* and overlying *Lystrosaurus* Assemblage Zones. The sediments assigned to the *Dicynodon* AZ are associated with stream deposits consisting of floodplain mudstones and subordinate, lenticular channel sandstones. Therapsids and other vertebrate fossils from the *Dicynodon* AZ are usually found as dispersed and isolated specimens in mudrock horizons, associated with an abundance of calcareous nodules. *Dicynodon lacerticeps* have been found on the Senekal commonage. Plant fossils (*Dadoxylon, Glossopteris*) and trace fossils (arthropod trails, worm burrows) are also present. Fossil trees of the *Dadoxylon* genus are common in the Winburg and Harrismith districts. A high occurrence of

fossil wood has been recorded on the farms Waterloop 698, Langlaagte 398, Helderwater 701, Onze Rust 700 and Blinkwater 702. Partially consolidated Quaternary alluvium found along river valleys near Senekal, are characterized by extensive erosion in the form of dongas, and are known to occasionally contain late Pleistocene vertebrate remains (e.g. *Phacochoerus sp*.) and even localized death assemblages (e.g. alcelaphine remains at Heelbo). However, there is currently no record of Quaternary-age fossils from alluvial sediments in the vicinity of the footprint.

Archaeology

Possible occurrences: Middle Stone Age sites, Later Stone Age sites, Iron Age / Agropastoralist settlements, graves, rock art, early Colonial / Historical / Military sites or structures.

The South African central plateau is distinctive in that it supported Stone Age people over thousands of years, who were also prolific makers of stone tools until relatively recent times. This can be seen in the high density of Stone Age archaeological traces visible on the landscape today. The range of archaeological sites encountered in the region is extensive, in terms of both typology and chronology. This may include retouched blades and trimmed points from the Middle Stone Age to the microlithic Wilton and Smithfield Complexes from the Holocene. Surface scatters of Later Stone Age and Middle Stone Age artifacts are frequent archaeological components along erosional gullies (dongas) of rivers and streams in the region. The incidence of surface scatters usually decreases away from localized areas such as riverine sites and dolerite-shale contact zones. Away from riverine contexts, Stone Age artifacts generally occur as contextually derived individual finds in the open veld. Several Later Stone Age sites have been identified near Bethlehem including the Saulspoort, Poortjie and Trekpad rockshelters. In addition to these shelters, several rock art localities, containing depictions of human figures, have been recorded in the Witteberge southeast of Paul Roux. A variety of stone dagga pipes have been collected in the region, including engraved sandstone and mudstone pipes, as well as a number made of baked clay. The region has also yielded Late Iron Age stone wall complexes. Stone enclosures found on and around dolerite koppies along the river valley between Winburg and Bethlehem, exhibit telltale signs of basic structural units including huts, large enclosures, remnants of walling and stone circles related to Late Iron Age settlements in the area. These sites were occupied from as early as the sixteenth and seventeenth centuries and represent a system that can be broadly attributed to groups ancestral to the Sotho-speaking people of today (Maggs 1976). Extensive Iron

Age settlements have been recorded previously between Paul Roux and Winburg at Three Sisters, Palmietfontein, Monte Carlo, La Rochelle, Leeukop, Vaalbank, Petra, Erfstuk, Allemanskraaldam, Fraai Uitzicht and the Allemanskraal Dam at the Willem Pretorius Nature Reserve.

Field Assessment

Investigation of the proposed development footprint indicates that:

- It has been severely degraded by construction activities related to the building of Cyferfontein Dam and nearby waterworks facility (**Fig. 4 & 5**).
- There are no indications of Stone Age artifacts, prehistoric structures, graves or rock engravings within the footprint.
- The site is underlain by geologically recent (cf. late Holocene) alluvium associated with adjacent Sand River overburden (**Fig. 6**). The alluvial deposits here are mostly made up of black to dark grey sandy clays varying between 0.5 m and 3 .0 m in thickness. There is no evidence for the accumulation and preservation of intact fossil material within these late Quaternary sediments.
- Fine- to medium-grained Adelaide Subgroup sandstones and Jurassic-age dolerites are outcropping along high ground to the east and south of the footprint, respectively (**Fig. 7).**

Impact Statement and Recommendations

Potential for palaeontological impact is considered low given age of the unconsolidated sediments underlying the proposed footprint. These sediments, also appear to cap a dolerite knick, point intersecting the river. The proposed development footprint is also located on degraded terrain and is not considered archaeologically vulnerable. There are no major archaeological grounds to suspend the proposed development, provided that all excavation activities are confined to within the confines of the development footprint. The study area is considered to be of low archaeological significance and is assigned a site rating of Generally Protected C (**Table 1**).

References

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Van Riet Lowe, C. 1941. *Prehistoric Art in South Africa*. Archaeological Series No. V. Bureau of Archaeology, Dept. of the Interior. Pretoria.

DECLARATION OF INDEPENDENCE

Paleo Field Services act as an independent specialist consultant. PFS do not or will not have any financial interest in the undertaking of the activity other than remuneration for work as stipulated in the terms of reference. PFS has no interest in secondary or downstream developments as a result of the authorization of this project.

Tables and Figures

Table 1. Field rating categories as prescribed by SAHRA.

Field Rating	**Grade**	**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

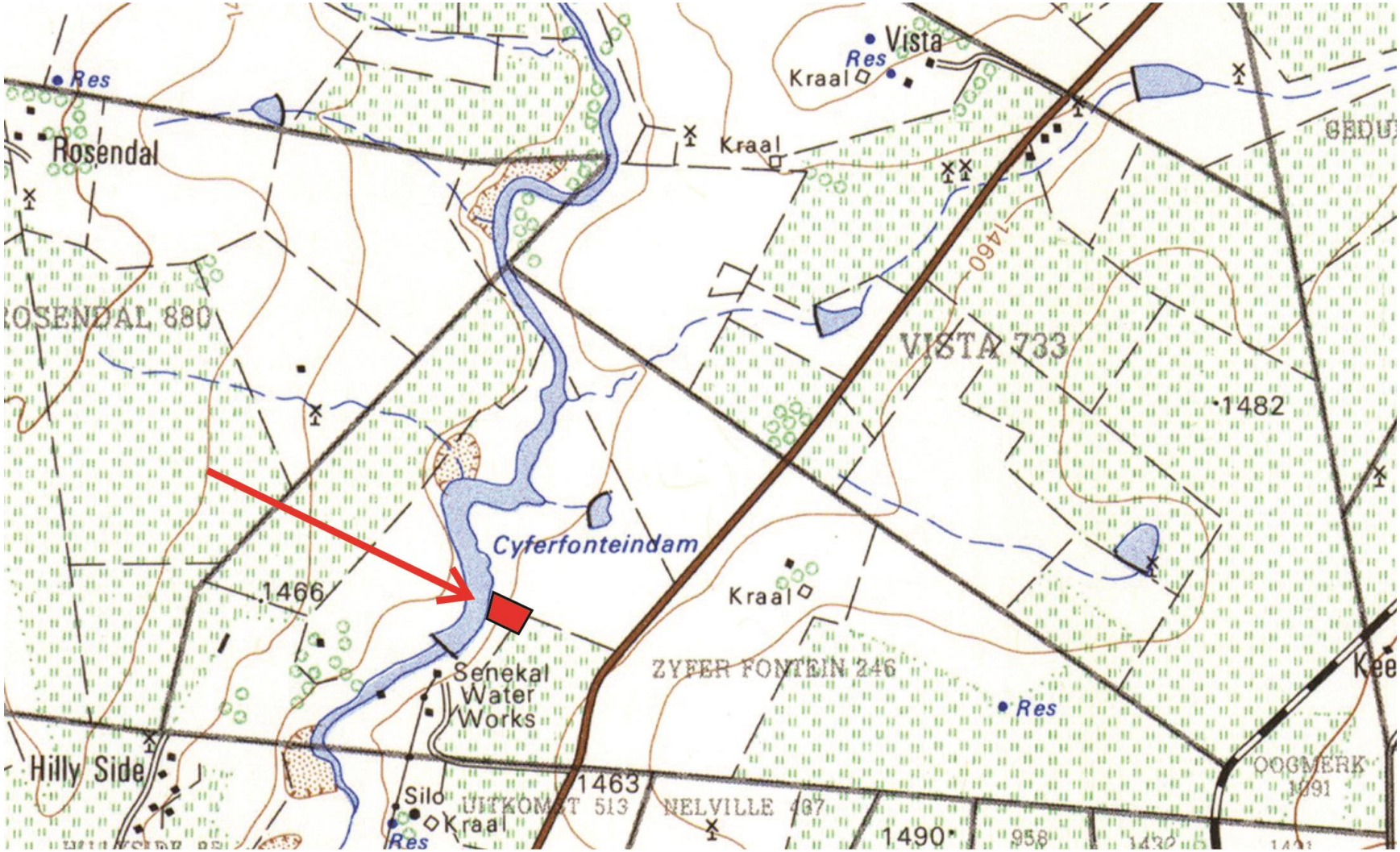


Figure 1. Map of the proposed development footprint (portion of 1:50 000 scale topographic map 2827BA Libertas).

Figure 2. Aerial view of the proposed abstraction site at the Cyferfontein Dam.

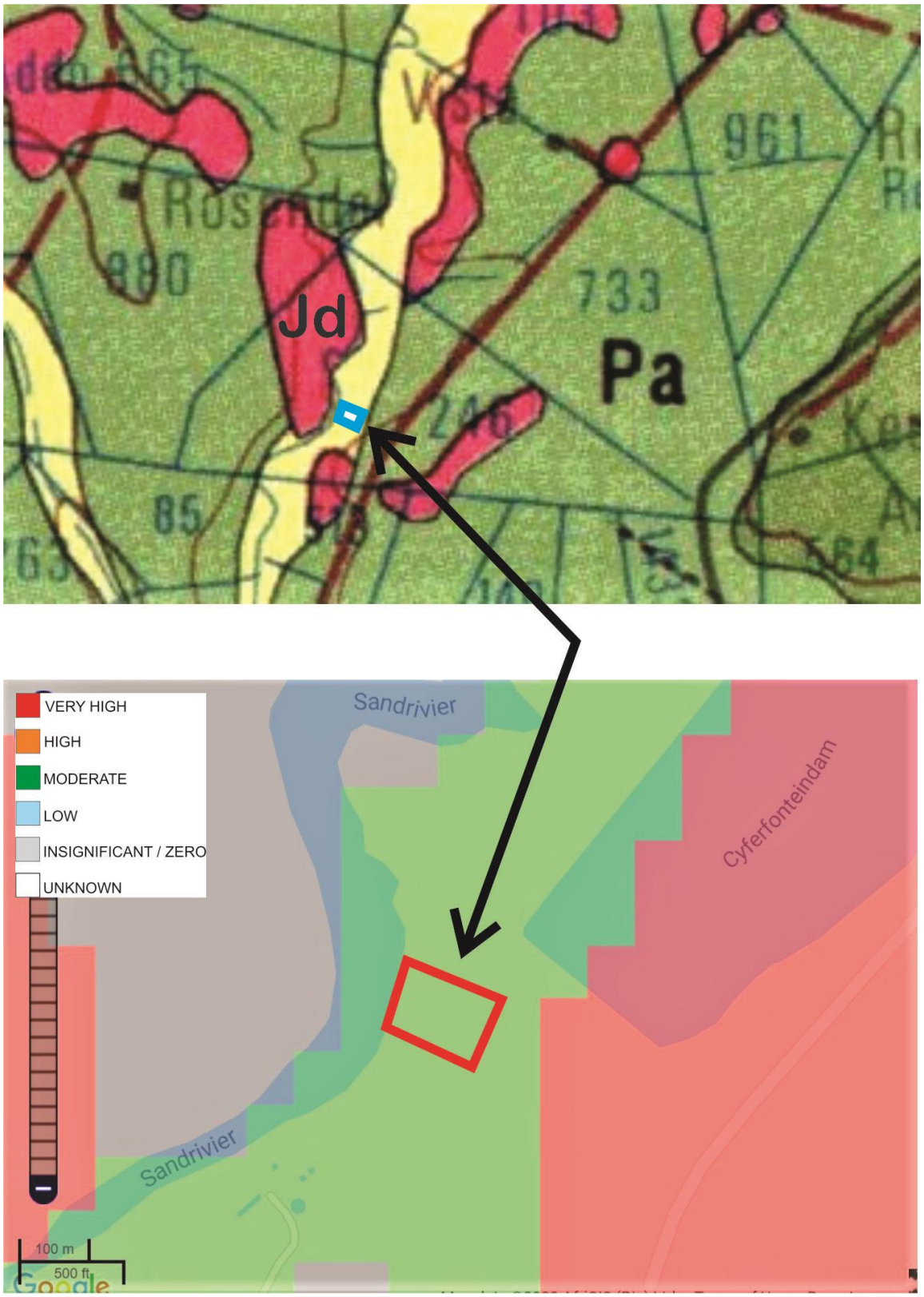


Figure 2. Portion of geological map 2826 Winburg (above) showing position of development footprint on geologically recent alluvium (yellow areas). Corresponding palaeosensitivity map below.

Figure 4. General view of the site, looking southwest (above) and northwest (below), standing near its eastern boundary.

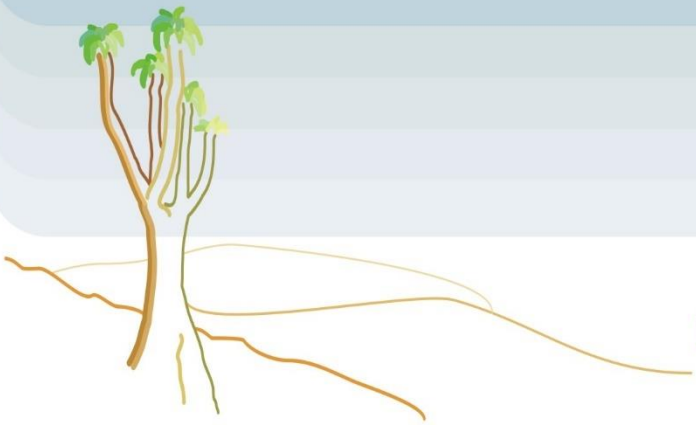
Figure 5. General view of the site, looking southwest (above) and west (below), standing near its southeastern boundary with dolerite outcrop in foreground.

Figure 6. General view of the site, standing at the eastern boundary, looking northwest towards the underlying dolerite knick point with geologically recent alluvium in foreground.

Sandstone (above) and dolerite outcropping along high ground
to the east and south of the footprint, respectively.
Scale 1 = 10 cm.

APPENDIX D_2

Ecologicall Report



DPR
Ecologists & Environmental Services

Wetland and Ecological Assessment for the proposed abstraction works in the Sand River at the Cyferfontein Dam near the town of Senekal, Free State Province.

February 2022

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DECLARATION OF INDEPENDENCE

DPR Ecologists and Environmental Services is an independent company and has no financial, personal or other interest in the proposed project, apart from fair remuneration for work performed in the delivery of ecological services. There are no circumstances that compromise the objectivity of the study.

Report Version	**Final 1.0**		
Title	**Wetland and Ecological Assessment for the proposed abstraction works in the Sand River at the Cyferfontein Dam near the town of Senekal, Free State Province.**		
Author	**DP van Rensburg (Pr.Sci.Nat)**		**Feb'22**

Executive Summary

The proposed abstraction works will take place within the Sand River which is located at the Cyferfontein Dam situated approximately 9 km to the north of the small town of Senekal (Appendix A: Map 1). The Cyferfontein Dam is an off-channel storage dam which is therefore not located within the channel of the Sand River, but adjacent to it. A weir is located in the river, which ensures the containment of some flow, where an abstraction point is then situated and water pumped to the Cyferfontein Dam. The infrastructure at this dam is no longer sufficient to supply the town with potable water and the proposed construction will entail a new abstraction point in the main channel of the river (this will also require the construction of a coffer dam).

The areas surrounding the proposed abstraction works has been degraded and transformed to varying degrees, but with patches of natural vegetation also being present. The areas along the floodplain of the river and portions adjacent to the abstraction works do however still consist of natural vegetation but with several areas being degraded by construction and the existing water works. It should therefore be evident that the surroundings has been degraded and transformed to a significant degree. A portion of remaining natural vegetation has however been observed to the west of the dam and here elements of conservation value was also identified.

The majority of the site and surroundings have been degraded. Remaining natural vegetation is dominated by pioneer species and exotic weeds which confirm a degraded condition. These areas are considered of Low conservation value. Furthermore, the natural vegetation type in this area, Central Free State Grassland, is currently of Least Concern (LC) and therefore does not contribute toward the conservation value of natural vegetation (Appendix A: Map 2). This is also confirmed by the Free State Biodiversity Management Plan which regards the area as an Ecological Support Area 1 & 2 which, although of low conservation value, does still aid in the functioning of the Sand River (Appendix A: Map 3). However, the exception to the above, is a portion of remaining natural grassland to the west of the Cyferfontein Dam (Appendix A: Map 1). Here, a substantial species diversity is present with many protected species and somewhat rarer species also being present. As a consequence, this area is regarded as having a High conservation value and should be excluded from the development and treated as a no-go area. It should be avoided by the proposed development as well as any associated activities, i.e. laydown areas, stockpile yards and vehicle movement. Ample areas are available for construction and it should not be difficult to avoid this portion. The Sand River itself as well as the associated floodplain and wetland areas should be regarded as having a Very High conservation value.

The proposed abstraction works will affect a portion of the main channel of the Sand River (Appendix A: Map 1). These impacts are anticipated to be most pronounced during construction and immediately thereafter.

Soil samples taken along the bank of the Sand River indicate a permanent zone of wetness along the marginal zone (water's edge) and is considered that saturated soil conditions exist year-round (Appendix C). These wetland conditions steadily decrease up the bank but it was clear that a seasonal zone of wetness still exists along the banks and seepage areas are also present. Temporary wetland conditions were also observed at the upper boundary of the upper zone and this indicated the border of wetland conditions. The banks and floodplain of the river is quite steep here and consequently an extensive floodplain is absent. The floodplain is narrow, steep and without any visible wetland conditions. The edge between this narrow floodplain and the

surrounding terrestrial environment is visible where the steep slope levels off into the surrounding plain and surface dolerite outcrops, indicating the edge of the riparian zone.

The off-channel Cyferfontein storage dam, abstracts water from the main channel and in so doing decreases the baseflow of the river which alters the flow regime significantly. The weir associated with this dam also act as flow barrier, and although not as significant as an in-channel storage dam, would also cause retardation of flow and obstruct flooding events and would therefore impact on the flow and flooding regime of the river. The weir has clearly also resulted in a significant change in the riparian zonation of the river. The baseflow water level has been elevated by the weir, essentially submerging the original and natural marginal zone and lower portion of the lower zone. These zones have now moved up the bank of the river, thus narrowing the original zones and significantly modifying the banks of the river. As can be seen, the weir has clearly had a significant impact on the river.

Several significant impacts has quite significantly affected the river at the site and the bed and bank morphology has also been significantly modified, mostly as a result of the downstream weir. Despite the modifications affecting the Sand River, it is still regarded as a highly sensitive system providing numerous vital ecosystem functions including water transportation, aquatic and wetland habitat, flood attenuation and bioremediation functions.

The Sand River which will be affected by the abstraction works is still natural to a significant extent although moderately modified by large impacts associated with the downstream weir, Cyferfontein Dam and upstream dryland crop cultivation. An Index of Habitat Integrity (IHI) was conducted and indicated that the river has an Instream and Riparian IHI of Category C: Moderately Modified. A summary of these results are included in Appendix D. The EI&S of the Sand River has been rated as being Moderate.

A Risk Assessment for the proposed abstraction works within the Sand River has been undertaken according to the Department of Water & Sanitation's requirements for risk assessment and the provisional Risk Assessment Matrix for Section 21(c) & (i) water use (Appendix E). The majority of impacts should occur during the construction phase and should largely be limited to it, provided that adequate rehabilitation and monitoring is undertaken after construction has been completed. The initial impacts of construction will entail the removal of riparian vegetation and substantial disturbance of the banks of the river at the abstraction site. This will destabilise the bank of the river and will result in erosion of the bank and sedimentation of the river. The construction works will also require the construction of a temporary coffer dam which will allow for dewatering a portion of the main channel of the river to allow for construction to take place. This will also have substantial impacts on the river. Initial impacts will be high when disturbance and infilling of the bed is undertaken. This is likely to release high volumes of sediment into the river. During construction this coffer dam will also require continuous dewatering in order to ensure that the construction area remains dry for construction. This water infiltration is also highly likely to become contaminated by construction waste such as cement, oils and grease and similar construction materials. The proposed abstraction works will result in significant impacts on the banks and main channel of the river. A comprehensive monitoring programme should therefore be followed to quantify impacts and recommend mitigation.

Taking into consideration all of the above and provided that adequate mitigation as recommended is implemented at the site, the proposed abstraction works should be limited to a moderate risk activity.

Table of contents

Ecological and Wetland Assessment

1. Introduction

1.1 Background

Natural vegetation is an important component of ecosystems. Some of the vegetation units in a region can be more sensitive than others, usually as a result of a variety of environmental factors and species composition. These units are often associated with water bodies, water transferring bodies or moisture sinks. These systems are always connected to each other through a complex pattern. Degradation of a link in this larger system, e.g. tributary, pan, wetland, usually leads to the degradation of the larger system. Therefore, degradation of such a water related system should be prevented.

Though vegetation may seem to be uniform and low in diversity it may still contain species that are rare and endangered. The occurrence of such a species may render the development unviable. Should such a species be encountered the development should be moved to another location or cease altogether.

South Africa has a large amount of endemic species and in terms of biological diversity ranks in the top ten in the world. This has the result that many of the species are rare, highly localised and consequently endangered. It is our duty to protect our diverse natural resources.

South Africa's water resources have become a major concern in recent times. As a water scarce country we need to manage our water resources sustainably in order to maintain a viable resource for the community as well as to preserve the biodiversity of the system. Thus, it should be clear that we need to protect our water resources so that we may be able to utilise this renewable resource sustainably. Areas that are regarded as crucial to maintain healthy water resources include wetlands, streams as well as the overall catchment of a river system.

Water is essential and crucial to the survival of all living organisms as well as ecosystem processes. This also applies to the survival of humans as we need daily intake of water. We, as humans, also utilise water for a range of other daily tasks and it is considered an essential component of our daily lives. It is therefore necessary for a community to have easy access to a potable water supply. The provision of water to a community must therefore take priority.

The proposed abstraction works will take place within the Sand River which is located at the Cyferfontein Dam situated approximately 9 km to the north of the small town of Senekal (Appendix A: Map 1). The Cyferfontein Dam is an off-channel storage dam which is therefore not located within the channel of the Sand River, but adjacent to it. A weir is located in the river, which ensures the containment of some flow, where an abstraction point is then situated and water pumped to the Cyferfontein Dam. The infrastructure at this dam is no longer sufficient to supply the town with potable water and the proposed construction will entail a new abstraction point in the main channel of the river (this will also require the temporary construction of a coffer dam). Although the current infrastructure, weir and off-channel dam all contribute to some modification of the system, the riparian zone, floodplain and wetland areas are all still natural and provide vital ecological functions.

A site visit was conducted on 08 December 2021. The study area consisted of the abstraction site also taking into consideration surrounding disturbance caused by laydown areas and

temporary access roads. The Sand River and immediate surroundings was surveyed by means of lateral transects across the river. The site survey was conducted during early summer after heavy rains and consequently vegetation identification was adequate and an active hydrological regime was present. This ensured accurate identification of watercourses and wetlands.

For the above reasons it is necessary to conduct an ecological and wetland assessment of an area proposed for development.

The report together with its recommendations and mitigation measures should be used to minimise the impact of the proposed development.

1.1 The value of biodiversity

The diversity of life forms and their interaction with each other and the environment has made Earth a uniquely habitable place for humans. Biodiversity sustains human livelihoods and life itself. Although our dependence on biodiversity has become less tangible and apparent, it remains critically important.

The balancing of atmospheric gases through photosynthesis and carbon sequestration is reliant on biodiversity, while an estimated 40% of the global economy is based on biological products and processes.

Biodiversity is the basis of innumerable environmental services that keep us and the natural environment alive. These services range from the provision of clean water and watershed services to the recycling of nutrients and pollution. These ecosystem services include:

- Soil formation and maintenance of soil fertility.
- Primary production through photosynthesis as the supportive foundation for all life.
- Provision of food, fuel and fibre.
- Provision of shelter and building materials.
- Regulation of water flows and the maintenance of water quality.
- Regulation and purification of atmospheric gases.
- Moderation of climate and weather.
- Detoxification and decomposition of wastes.
- Pollination of plants, including many crops.
- Control of pests and diseases.
- Maintenance of genetic resources.

1.2 Value of wetlands and watercourses

Freshwater ecosystems provide valuable natural resources, which contributes toward economic, aesthetic, spiritual, cultural and many recreational values. Yet the integrity of freshwater ecosystems in South Africa is rapidly declining in recent times. This crisis is largely a consequence of a variety of challenges that are practical (managing vast areas of land to maintain connectivity between freshwater ecosystems), socio-economic (the need to utilise these recourses between different stakeholders, i.e. individuals, communities, corporate and industrial) and institutional (Implementing appropriate governance and management). Water affects every activity and aspiration of human society and sustains all ecosystems.

Freshwater ecosystems provide many of our fundamental needs, enable important regulating ecosystem services, supports functional faunal and floral communities:

- Water for drinking and irrigation
- Food such as fish and water plants.
- Building material such as clay and reeds.
- Preventing floods and easing the impacts of droughts.
- Remove excess nutrients and toxic substances from water
- Rivers, wetlands and groundwater systems maintain water supplies and buffer the effects of storms, reducing the loss of life and property to floods.
- Riverbanks help to trap sediments, stabilise
- river banks and break down pollutants draining from the surrounding land.

1.3 Details and expertise of specialist

DPR Ecologists and Environmental Services (Pty) Ltd.
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Professional registration:
South African Council for Natural Scientific Professions No. (400284/13) (Ecological Science).

Membership with relevant societies and associations:

- South African Society of Aquatic Scientists (SASAQS0091)
- South African Association of Botanists
- South African Wetlands Society (3SLY4IG4)

Expertise:

- Qualifications: B.Sc. (Hons) Botany (2008), M.Sc. in Vegetation Ecology (2012) with focus on ephemeral watercourses.
- Vegetation ecologist with over 10 years experience of conducting ecological assessments.
- Founded DPR Ecologists & Environmental Services (Pty) Ltd in 2016.
- Has conducted over 200 ecological and wetland assessments for various developments.
- Regularly attend conferences and courses in order to stay up to date with current methods and trends:

  2017: Kimberley Biodiversity Symposium.
  2018: South African Association of Botanists annual conference.
  2018: National Wetland Indaba Conference.
  2019: SASS5 Aquatic Biomonitoring Training.
  2019: Society for Ecological Restoration World Congress 2019.
  2019: Wetland rehabilitation: SER 2019 training course.

2020: Tools For Wetlands (TFW) training course.

2. Scope and limitations

- To evaluate the present state of the vegetation and ecological functioning of the Sand River site proposed for abstraction works.
- To provide a description of watercourses, wetlands and riparian vegetation included within the study area.
- Identify watercourses including rivers, streams, pans and wetlands and determine the presence of wetland conditions within these systems.
- Where wetland conditions have been identified the classification of the wetland system will be given.
- To evaluate the present state of the wetlands and riparian vegetation in close proximity to the site. The importance of the ecological function and condition will also be assessed.
- Determine the Present Ecological State (PES) and Ecological Importance & Sensitivity (EIS) for the watercourses in close proximity to operations.
- Conduct a risk assessment and determine the likelihood that watercourses and wetlands will be adversely affected by the development.

2.1 Riparian Vegetation

Aspects of the riparian vegetation that will be assessed include:

- The vegetation types of the region with their relevance to the study area.
- The overall status of the riparian vegetation along the wetlands and watercourses in the study area.
- Species composition with the emphasis on dominant-, rare- and endangered species.
- Presence of wetland conditions and riparian vegetation using obligate wetland and riparian species.

The amount of disturbance present on the study area assessed according to:

- The amount of grazing impacts.
- Disturbance caused by human impacts.
- Other disturbances.

2.2 Fauna

Aspects of the fauna that will be assessed include:

- A basic survey of the fauna occurring in the region using visual observations of species as well as evidence of their occurrence in the region (burrows, excavations, animal tracks, etc.). This will be based on terrestrial fauna and focused on species observed at the watercourses.
- The overall condition of the habitat.

2.3 Wetlands and watercourses

Aspects of the wetlands and watercourses that will be assessed include:

- Identification of watercourses including rivers, streams, pans and wetlands.
- Determine the presence of wetland conditions and riparian vegetation using obligate wetland and riparian species.
- Describe watercourses and wetlands and importance relative to the larger system.

- Conduct habitat integrity assessment of watercourses to inform the condition and status of these systems.

2.4 Limitations

- Several bulbous and herbaceous species may have finished flowering and may have been overlooked or not identifiable.
- Although a comprehensive survey of the site was done it is still likely that several species were overlooked.
- Due to time constraints only limited surveys of watercourses were done.
- Smaller drainage lines may have been overlooked where a distinct channel or riparian vegetation is absent.
- Some animal species may not have been observed as a result of their nocturnal and/or shy habits.
- Some fauna may not have been observed due to being in a dormant state or overwintering in egg or embryo form.

3. Methodology

3.1 Several literature works were used for additional information.

General ecology:

- Red Data List (Raymondo *et al.* 2009).
- Vegetation types (Mucina & Rutherford 2006).
- NBA 2018: South African Inventory of Inland Aquatic Ecosystems (SAIIAE).
- NBA 2018 Technical Report: Inland Aquatic (Freshwater) Realm.
- NBA 2018 Technical Report Volume 1: Terrestrial Realm.
- National Freshwater Ecosystem Priority Areas 2011 (NFEPA).
- Strategic Water Source Areas 2018 (SWSA).
- SANBI (2011): List of threatened ecosystems.
- NEM:BA: List of threatened ecosystems and Threatened Or Protected Species (TOPS).
- Biodiversity Plan Free State Province (2018).

Vegetation:

- Red Data List (Raymondo *et al.* 2009).
- Vegetation types (Mucina & Rutherford 2006).
- Field guides used for species identification (Bromilow 1995, 2010, Coates-Palgrave 2002, Fish *et al* 2015, Gerber *et al* 2004, Gibbs-Russell *et al* 1990, Griffiths & Picker 2015, Manning 2009, Moffett 1997, Pooley 1998, 2003, Retief & Meyer 2017, Van Ginkel & Cilliers 2020, Van Ginkel *et al* 2011, Van Oudtshoorn 2004, Van Wyk & Malan 1998, Van Wyk & Van Wyk 1997, Venter & Joubert 1985).

Terrestrial fauna:

- Field guides for species identification (Smithers 1983, Child *et al* 2016, Cillié 2018).

Wetland methodology, delineation and identification:

- Department of Water Affairs and Forestry 2004, 2005, 2008, Collins 2006, Duthie 1999, Kleynhans *et al* 2008, Marnewecke & Kotze 1999, Nel *et al* 2011, SANBI 2009.

3.2 Survey

The site was assessed by means of transects and sample plots. Observation w.r.t. the general ecology of the area includes:

- Noted species include rare and dominant species.
- The broad vegetation types present at the site were determined.
- The state of the environment was assessed in terms of condition, grazing impacts, disturbance by humans, erosion and presence of invader and exotic species.
- The state of the habitat was also assessed.

Ecological aspects surveyed and recorded includes:

- The overall ecology of an area including the diversity of species, uniformity or diversity of habitats and different vegetation communities.

- Identification and delineation of distinct vegetation communities ad habitats and the ecological drivers responsible for these distinct communities, i.e. soil, geology, topography, aspect, etc.
- A comprehensive plant species survey including the identification of protected, rare or threatened species.
- Any ecological process or function which is important to the ecosystem including ecological drivers such as fire, frost, grazing, browsing, etc. and any changes to these processes.

Animal species were also noted as well as the probability of other species occurring on or near the site according to their distribution areas and habitat requirements.
The state of the habitat was also assessed.

All rivers, streams, pans and wetlands were identified and surveyed where they occurred in the study area. These systems were determined by use of topography (land form and drainage pattern) and riparian vegetation with limited soil sampling (Appendix B & C). The following outlines the process applied during the on-site survey in order to obtain all required data:

- Perform desktop overview of the study area utilising available resources (Section 3.1). From the desktop overview identify the different landscape forms, possible wetland areas, watercourses and their relative flow patterns. Using this information, identify transects and sample plots for possible on-site survey. This should be both representative of the wetland or watercourse as a whole but should also include any prominent or significantly unique features.
- Possible sites identified during the desktop overview should be surveyed on-site. Where access is not possible or where desktop features are considered poor representatives of the wetland or watercourse the survey site or transect should be moved to another location, without compromising a comprehensive overview of the system.
- Where a lateral transect is taken of a watercourse this is done from the water's edge, across the marginal, lower and upper zones and extended across the floodplain until the edge of the riparian zone is reached.
- Where a transect is taken of a wetland system, this should preferably be taken across the entire wetland at its widest part or where it is most relevant to the proposed development, from the terrestrial surroundings, across the temporary, seasonal and perennial zones across the wetland.
- Soil samples are taken at 10 meter intervals along the survey transect, or where a distinct transition into a different zone is observed.
- A survey of the plant species within each distinct riparian or wetland zone is undertaken and includes the identification of obligate wetland species, riparian species, terrestrial species, exotic species and the general species composition and vegetation structure which allows for an accurate description of the watercourse or wetland.
- Visual survey of the general topography which substantiates the presence of riparian zones and wetland forms.
- Other general observations include any impacts observed, the overall ecosystem function, presence of fauna, surrounding land uses and the overall condition of the watercourse or wetland.
- Data is recorded by means of photographs with GPS coordinates taken at all relevant soil sampling sites and borders of riparian and wetland zones.

Data obtained during the on-site survey is utilised to provide the following information on the system:

- Desktop overview and assimilation of information on the likely impacts and functioning of the wetland system.
    - Review all available spatial data and resources in order to provide an estimate of the likely impacts and condition of the wetland or watercourse system.
- Confirm the presence of the wetland or watercourse system and provide an estimate of its borders.
    - The border of wetland conditions or the edge of the riparian zone will be confirmed by using soil sampling, obligate wetland vegetation and topography. This will also include the delineation of any temporary, seasonal or perennial zones of wetness along wetlands and the marginal, lower, upper and riparian zones along watercourses.
- Provide a description of the wetland or watercourse.
    - Provide the hydrogeomorphic setting of the wetland, a longitudinal profile which will aid in determining the erodibility of the wetland and provide an overall description of the wetland and impacts affecting it.
    - Provide a general description of the lateral zonation of the watercourse banks including the marginal, lower, upper and riparian zones and a description of the riparian vegetation along the banks of the watercourse. This will also include the description of any impacts or modification of the watercourse.
- Assess the current condition of the wetland or watercourse.
    - Utilising information obtained from the assessments listed above, determine the condition of this portion of the wetland by applying the WET-Health 2 tool.
    - Utilising information obtained from the assessments listed above, determine the condition of the relevant section of the watercourse by applying the Index of Habitat Integrity (IHI) tool.
- Utilising all of the information obtained from the assessment, provide recommendations to mitigate anticipated impacts that the development will have.

The following guidelines and frameworks were also used to determine the presence of the rivers, streams, pans and wetlands in the study area:

- Department of Water Affairs and Forestry. 2005. A practical field procedure for identification and delineation of wetlands and riparian areas. Edition 1. Department of Water Affairs and Forestry, Pretoria.
- Marnewecke & Kotze 1999. Appendix W6: Guidelines for delineation of wetland boundary and wetland zones. In: MacKay (Ed.), H. Resource directed measures for protection of water resources: wetland ecosystems. Department of Water Affairs and Forestry, Pretoria.

The following guidelines and frameworks were used to determine the sensitivity or importance of these identified watercourses or wetlands in the study area:

- Nel *et al.* (2011). Technical Report for the National Freshwater Ecosystem Priority Areas project. WRC Report No. K5/1801.

- Government of South Africa. 2008. National Protected Area Expansion Strategy for South Africa 2008: Priorities for expanding the protected area network for ecological sustainability and climate change adaptation. Government of South Africa, Pretoria.

- Duthie, A. 1999. Appendix W5: IER (floodplain and wetlands) determining the Ecological Importance and Sensitivity (EIS) and Ecological Management Class (EMC). In: MacKay (Ed.), H. Resource directed measures for protection of water resources: wetland ecosystems. Department of Water Affairs and Forestry, Pretoria.

These guidelines provide the characteristics which can be utilised to determine if a wetland or watercourse is present and also aids in determining the boundary of these systems.

The following were utilised to inform the condition and status of watercourses:

- Kleynhans, C.J., Louw, M.D. & Graham, M. 2008. Module G: EcoClassification and EcoStatus determination in River EcoClassification: Index of Habitat Integrity. Joint Water Research Commission and Department of Water Affairs and Forestry report. WRC Report No. TT 377-08.

The following were utilised to inform the condition and status of wetlands:

- Macfarlane, D.M., Ollis, D.J. & Kotze, D.C. 2020. WET-Health (Version 2.0): a refined suite of tools for assessing the present ecological state of wetland ecosystems. WRC Report No. TT 820/20.

A Risk Assessment will be conducted for the proposed development in or near watercourses and wetlands in accordance with the Department of Water & Sanitation's requirements for risk assessment and the provisional Risk Assessment Matrix for Section 21(c) & (i) water use.

3.3 Criteria used to assess sites

The following criteria is also applied during the site survey to further inform the general sensitivity and conservation value of the site or specific elements on the site. These criteria were used to assess the site and determine the overall status of the environment.

3.3.1 Vegetation characteristics

Characteristics of the vegetation in its current state. The diversity of species, sensitivity of habitats and importance of the ecology as a whole.

Habitat diversity and species richness: normally a function of locality, habitat diversity and climatic conditions.
Scoring: Wide variety of species occupying a variety of niches – 1, Variety of species occupying a single nich – 2, Single species dominance over a large area containing a low diversity of species – 3.

Presence of rare and endangered species: The actual occurrence or potential occurrence of rare or endangered species.
Scoring: Occurrence actual or highly likely – 1, Occurrence possible – 2, Occurrence highly unlikely – 3.

Ecological function: All plant communities play a role in the ecosystem. The ecological importance of all areas though, can vary significantly e.g. wetlands, drainage lines, ecotones, etc.
Scoring: Ecological function critical for greater system – 1, Ecological function of medium importance – 2, No special ecological function (system will not fail if absent) – 3.

Degree of rarity/conservation value:
Scoring: Very rare and/or in pristine condition – 1, Fair to good condition and/or relatively rare – 2, Not rare, degraded and/or poorly conserved – 3.

3.3.2 Vegetation condition

The sites are compared to a benchmark site in a good to excellent condition. Vegetation management practises (e.g. grazing regime, fire, management, etc.) can have a marked impact on the condition of the vegetation.

Percentage ground cover: Ground cover is under normal and natural conditions a function of climate and biophysical characteristics. Under poor grazing management, ground cover is one of the first signs of vegetation degradation.
Scoring: Good to excellent – 1, Fair – 2, Poor – 3.

Vegetation structure: This is the ratio between tree, shrub, sub-shrubs and grass layers. The ratio could be affected by grazing and browsing by animals.
Scoring: All layers still intact and showing specimens of all age classes – 1, Sub-shrubs and/or grass layers highly grazed while tree layer still fairly intact (bush partly opened up) – 2, Mono-layered structure often dominated by a few unpalatable species (presence of barren patches notable) – 3.

Infestation with exotic weeds and invader plants or encroachers:
Scoring: No or very slight infestation levels by weeds and invaders – 1, Medium infestation by one or more species – 2, Several weed and invader species present and high occurrence of one or more species – 3.

Degree of grazing/browsing impact:
Scoring: No or very slight notable signs of browsing and/or grazing – 1, Some browse lines evident, shrubs shows signs of browsing, grass layer grazed though still intact – 2, Clear browse line on trees, shrubs heavily pruned and grass layer almost absent – 3.

Signs of erosion: The formation of erosion scars can often give an indication of the severity and/or duration of vegetation degradation.
Scoring: No or very little signs of soil erosion – 1, Small erosion gullies present and/or evidence of slight sheet erosion – 2, Gully erosion well developed (medium to large dongas) and/or sheet erosion removed the topsoil over large areas – 3.

3.3.3 Faunal characteristics

Presence of rare and endangered species: The actual occurrence or potential occurrence of rare or endangered species on a proposed site plays a large role on the feasibility of a development.

Depending on the status and provincial conservation policy, presence of a Red Data species or very unique and sensitive habitats can potentially be a fatal flaw.
Scoring: Occurrence actual or highly likely – 1, Occurrence possible – 2, Occurrence highly unlikely.

3.4 Biodiversity sensitivity rating (BSR)

The total scores for the criteria discussed in section 3.3 were used to determine the biodiversity sensitivity ranking for the sites. On a scale of 0 – 30, five different classes are described to assess the biodiversity of the study area. The different classes are described in the Table 1:

Table 1: Biodiversity sensitivity ranking

BSR	BSR general floral description	Floral score equating to BSR class
Totally transformed (5)	Vegetation is totally transformed or in a highly degraded state, generally has a low level of species diversity, no species of concern and/or has a high level of invasive plants. The area has lost its inherent ecological function. The area has no conservation value and potential for successful rehabilitation is very low.	29 – 30
Advanced Degraded (4)	Vegetation is in an advanced state of degradation, has a low level of species diversity, no species of concern and/or has a high level of invasive plants. The area's ecological function is seriously hampered, has a very low conservation value and the potential for successful rehabilitation is low.	26 – 28
Degraded (3)	Vegetation is notably degraded, has a medium level of species diversity although no species of concern are present. Invasive plants are present but are still controllable. The area's ecological function is still intact but may be hampered by the current levels of degradation. Successful rehabilitation of the area is possible. The conservation value is regarded as low.	21 – 25
Good Condition (2)	The area is in a good condition although signs of disturbance are present. Species diversity is high and species of concern may be present. The ecological function is intact and very little rehabilitation is needed. The area is of medium conservation importance.	11 – 20
Sensitive/Pristine (1)	The vegetation is in a pristine or near pristine condition. Very little signs of disturbance other than those needed for successful management are present. The species diversity is very high with several species of concern known to be present. Ecological functioning is intact and the conservation importance is high.	0 - 10

4. Ecological and Wetland Assessment

For the purpose of this report the general ecology of the study area will first be discussed followed by a discussion of the watercourses and wetland systems.

4.1 Ecology and description of the study area

Refer to the list of species encountered on the site in Appendix B.

According to Mucina & Rutherford (2006) the immediate surroundings consist of Central Free State Grassland (Gh 6). The vegetation type is currently listed as being of Least Concern (LC) according to the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) (Appendix A: Map 2). Although it is quite heavily affected by transformation for dryland crop cultivation, it is not yet considered as severe enough to be regarded a Threatened Ecosystem. Portions of this vegetation type around the construction areas will therefore not have a high conservation value, however, elements of conservation concern may still be present in natural areas. The areas surrounding the current water works and Cyferfontein Dam has also been degraded to varying degrees by previous construction and existing structures and infrastructure, but patches of natural vegetation do still occur and does also contain elements of conservation significance.

The Free State Province Biodiversity Management Plan (2015) has recently been published and has identified areas which are essential to meeting conservation targets for specific vegetation types, i.e. Critical Biodiversity Areas. The site for the proposed abstraction works is listed as being an Ecological Support Areas 1 & 2 (ESA 1 & 2) (Appendix A: Map 3). This indicates that the area has been degraded to varying degrees by the surrounding landuse but forms part of the functioning of the Sand River and as a result does provide important functions in the support of this system.

The proposed abstraction works will take place within the Sand River which is located at the Cyferfontein Dam situated approximately 9 km to the north of the small town of Senekal (Appendix A: Map 1). The Cyferfontein Dam is an off-channel storage dam which is therefore not located within the channel of the Sand River, but adjacent to it. A weir is located in the river, which ensures the containment of some flow, where an abstraction point is then situated and water pumped to the Cyferfontein Dam. The infrastructure at this dam is no longer sufficient to supply the town with potable water and the proposed construction will entail a new abstraction point in the main channel of the river (this will also require the temporary construction of a coffer dam). Although the current infrastructure, weir and off-channel dam all contribute to some modification of the system, the riparian zone, floodplain and wetland areas are all still natural and provide vital ecological functions.

Figure 1: View of the proposed location of the abstraction works. Existing infrastructure is visible and causes some disturbance though the area is clearly still dominated by natural vegetation.

Figure 2: General view of the surrounding area with a gently sloping topography and natural grassland. The located of the Sand River is indicated in the background.

The areas surrounding the proposed abstraction works has been degraded and transformed to varying degrees, but with patches of natural vegetation also being present. This is confirmed, to some degree, by the National Biodiversity Assessment (2018), which indicates that the Cyferfontein Dam and areas to the south of it is transformed and no longer regarded as consisting of natural vegetation (Appendix A: Map 2). The areas along the floodplain of the river and portions adjacent to the abstraction works do however still consist of natural vegetation but with several areas being degraded by construction and the existing water works. Large areas have been transformed by historical crop cultivation and these areas are most prominent to the south of the dam. The dam itself is also responsible for transformation of a significant portion of vegetation while associated structures, buildings, reservoirs, pipelines, powerlines, dirt tracks and pump stations has also resulted in transformation and degradation of the natural vegetation. It should therefore be evident that the surroundings has been degraded and transformed to a significant degree. A portion of remaining natural vegetation has however been observed to the west of the dam and here elements of conservation value was also identified. This will be discussed in detail in the following paragraphs.

Figure 3: The existing Cyferfontein Dam does cause significant transformation of the area.

Figure 4: Structures and infrastructure associated with the dam also contribute toward disturbance. Note exotic weeds in foreground (*Verbena tenuisecta*).

Figure 5: Despite the general disturbance of the area, natural grassland and elements of conservation value does also still remain in the area.

The topography of the site and surroundings are dominated by undulating plains with low ridges, formed by sandstone outcrops. The site itself is being dominated by the Sand River, its main channel, floodplain and immediate surrounding terrestrial areas. The river at the abstraction site and immediate surroundings contain a fairly steep bank with a narrow floodplain. The main

channel has been modified to some extent by the downstream weir which essentially floods the main channel and elevates the baseflow level. The topography to the east of the abstraction site is quite modified by the existing Cyferfontein Dam.

The mean annual rainfall for Senekal is given as 638 mm. Temperatures range from an average of 21.6°C in January to an average of 8.3°C in July.

The underlying geology of the region consists of mudstones and sandstone of the Adelaide Formation (Beaufort Group). Sandstone outcrops, resistant to weathering, form isolated hills and ridges.

The proposed abstraction works will largely affect the riverbanks, floodplain and associated wetland areas and the riparian vegetation associated with these areas (Appendix A: Map 1). The riparian vegetation will however be discussed in detail in the wetland section of the report. Although the development will mostly be confined to the Sand River and associated floodplain and wetland areas, the construction activities such as laydown areas, stockpile yards and vehicle movement is also likely to affect the adjacent terrestrial areas. Consequently, the following discussion will provide a description of these surrounding terrestrial areas and provide an indication of the overall condition and presence of elements of high conservation value.

As indicated previously, the majority of remaining natural vegetation has been degraded to a large extent by a variety of impacts, mostly associated with the existing Cyferfontein Dam and water works. This disturbance is most evident in close proximity to the dam, buildings and infrastructure. Here the vegetation is often dominated by exotic weeds. In those areas where disturbance is highest, the grass layer is notably low in percentage ground cover and dominated by pioneer species such as *Cymbopogon pospischillii* and *Cynodon dactylon*. Dwarf karroid shrubs such as *Pentzia incana* and pioneer herbs such as *Lepidium africanum* and *Berkheya macrocephala* are also abundant. This is indicative of a generally degraded and modified natural grassland vegetation layer. In addition, exotic weeds are also abundant and provides a further indication of the degraded condition of the natural vegetation. These include weeds such as *Verbna tenuisecta, Conyza bonariensis, Plantago lanceolata, Schkuhria pinata, Verbena bonariensis* and *Cirsium vulgare*. As can be seen, these areas are fairly degraded and consequently they will have a relatively Low conservation value.

Although, as indicated in the previous paragraph, the majority of the surrounding areas are generally degraded, areas of comparatively natural grassland are also still present. Such an area is especially prominent to the west of the Cyferfontein Dam. Here a much more natural grass composition is present with species such as *Themeda triandra, Eragrostis lehmanniana, Cymbopogon pospischillii, Sporobolus fimbriatus* and *Eragrostis chloromelas* dominating. It was also notable that this portion contained numerous protected plant species with several also being regarded as fairly rare. Geophytic bulbs which are also listed as protected species included *Ammocharis coranica, Asclepias stellifera* and *Haemanthus montanus*. A few protected succulent species were also present here including *Euphorbia clavaroides, Euphorbia pseudotuberosa* and *Aloe jeppeae*. Of these the last two are also quite rare and not often encountered. All of these protected plant species will still have a significant conservation value. In addition, a higher proportion or diversity of such protected species together in one area, will also contribute toward the conservation value of this area. Consequently, this portion of remaining natural grassland to the west of the Cyferfontein Dam is regarded as having a High conservation value. This area should therefore be regarded as a no-go area and avoided by the proposed development and any associated activities, i.e. laydown areas, stockpile yards and

vehicle movement. Ample areas are available for construction and it should not be difficult to avoid this portion. Avoiding this area will also, by default, ensure the preservation of the protected plant species as listed above.

Figure 6: Remaining natural grassland to the west of the Cyferfontein Dam contain a large proportion of protected species of significant conservation value. These include, clockwise from top left; *Aloe jeppeae, Asclepias stellifera, Euphorbia clavaroides, Amocharis coranica, Haemanthus montanus, Euphorbia pseudotuberosa*.

The study area consists of the Sand River, associated floodplain and wetland areas, and adjacent areas of terrestrial vegetation (Appendix A: Map 1). As previously indicated, the area has been degraded to large extent by several impacts. The Sand River has also been affected by numerous significant impacts, but which will be discussed in greater detail within the wetland assessment section of the report.

From the above discussions, it should be clear that the site and surroundings have been largely degraded. Remaining natural vegetation is dominated by pioneer species and exotic weeds which confirm a degraded condition. These areas are considered of Low conservation value. Furthermore, the natural vegetation type in this area, Central Free State Grassland, is currently of Least Concern (LC) and therefore does not contribute toward the conservation value of natural vegetation (Appendix A: Map 2). This is also confirmed by the Free State Biodiversity Management Plan which regards the area as an Ecological Support Area 1 & 2 which, although of low conservation value, does still aid in the functioning of the Sand River (Appendix A: Map 3). However, the exception to the above, is a portion of remaining natural grassland to the west of the Cyferfontein Dam (Appendix A: Map 1). Here, a substantial species diversity is present with many protected species and somewhat rarer species also being present. As a consequence, this area is regarded as having a High conservation value and should be excluded from the development and treated as a no-go area. It should be avoided by the proposed development as well as any associated activities, i.e. laydown areas, stockpile yards and vehicle movement. Ample areas are available for construction and it should not be difficult to avoid this portion. The Sand River itself as well as the associated floodplain and wetland areas should be regarded as having a Very High conservation value but will be discussed in detail in the following wetland assessment sections.

4.2 Overview of terrestrial fauna (actual & possible)

Signs and tracks of mammals are abundant along the banks of the Sand River and adjacent areas. Watercourses provide a high biomass, perennial foraging and a large prey base and are therefore able to sustain a larger and more diverse mammal population. The mammal population around the site is however anticipated to be somewhat modified from the natural condition. The proximity of the existing water works and frequent human activities, as well as the generally degraded condition of the available habitat, will also affect the mammal population on the site. As a consequence it is also considered unlikely that any species of conservation concern would remain in the area. These species normally require pristine habitat and are sensitive to human induced disturbances. The likelihood that such a species may occur can however not be discounted.

The mammal survey of the site was conducted by means of active searching and recording any tracks or signs of mammals and actual observations of mammals. From the survey the following actual observations of mammals were recorded:

- Tracks of a small carnivore, which when considering the absence of defined nail marks, are most likely a small feline species, but which cannot be positively identified.

- Several burrows of small mammals were noted which could not be identified but do indicate a significant mammal population in the area.

- Tracks of small antelope, most probably Steenbok (*Raphicerus campestris*) or Common Duiker (*Sylvicapra grimmia*), are also common. These species are both widespread but confined to fairly natural or agricultural areas and generally avoid urban areas.

- Scat of a large carnivore, which could not be identified. Judging by the high amount of hair as well as a whitish colour (indicating bone) this is most probably that of a Caracal *(Caracal caracal* subsp*. caracal*), although it may also be another species.

The impact the proposed abstraction works which will also affect the Sand River, its floodplain and associated wetland areas will have is mainly concerned with the loss of habitat. However, as previously indicated the habitat which will be affected has already been modified to some degree by surrounding land uses. Furthermore, the footprint of the development will not be extensive and should therefore limit the impact on mammals. Provided that adequate rehabilitation is undertaken it is also likely that there will not be a large and long-lasting impact on the mammal population.

The hunting, capturing or harming in any way of fauna on the site must be prohibited. In the event of venomous animals, such as snakes, encountered on the site an experienced snake handler should be contacted to remove it from the site.

Table 2: Red Listed mammals likely to occur in the study area (Mammalmap & Child *et al* 2016).

Scientific name	Common name	Status
Damaliscus lunatus lunatus	(Southern African) Tsessebe	Vulnerable
Damaliscus pygargus pygargus	Bontebok	Vulnerable
Hippotragus niger niger	Sable	Vulnerable
Kobus leche	Lechwe	Near Threatened
Pelea capreolus	Vaal Rhebok	Near Threatened
Equus zebra hartmannae	Hartmann's Mountain Zebra	Vulnerable
Mystromys albicaudatus	African White-tailed Rat	Vulnerable
Leptailurus serval	Serval	Near Threatened
Pelea capreolus	Vaal Rhebok	Near Threatened

From historical records (Table 2) it is evident that the area contains numerous Red Listed mammals. However, the majority of these consist of larger mammals and are historical records and would currently only be found within conservation areas, they are not of consequence to the development. However, the smaller mammals, notably the White-tailed Rat and Serval, may still occur in this area. Given the tracks and signs of a small feline on the site, the likelihood that Serval may also occur in the area cannot be discounted.

Figure 18: Tracks and signs of mammals on the site include clockwise from top left; Tracks of a small antelope most likely Steenbok (*Raphicerus campestris*) or Common Duiker (*Sylvicapra grimmia*), burrow of an unidentified small mammal, Track of a small feline and scat of a medium-sized carnivore, likely a Caracal (*Caracal caracal* subsp. *caracal*).

4.3 Wetland and Watercourses Assessment

4.3.1 Introduction

The proposed abstraction works will affect a portion of the main channel of the Sand River (Appendix A: Map 1). These impacts are anticipated to be most pronounced during construction and immediately thereafter. The Sand River, banks and floodplain which will be affected by the abstraction works will be discussed in the following sections.

The term watercourse refers to a river, stream, wetland or pan. The National Water Act (NWA, 1998) includes rivers, streams, pans and wetlands in the definition of the term watercourse. This definition follows:

Watercourse means:

- A river or spring.
- A natural channel in which water flows regularly or intermittently.
- A wetland, lake or dam into which water flows.
- Any collection of water which the Minister may, by notice in the Gazette, declare to be a watercourse, and a reference to a watercourse includes, where relevant, its bed and banks.

Riparian habitat is an accepted indicator of watercourses used to delineate the extent of wetlands, rivers, streams and pans (Department of Water Affairs and Forestry 2005).

The Sand River has been listed as a second order watercourse. The classification of stream orders from 1 to 3 can be illustrated by means of the Strahler 1952 classification:

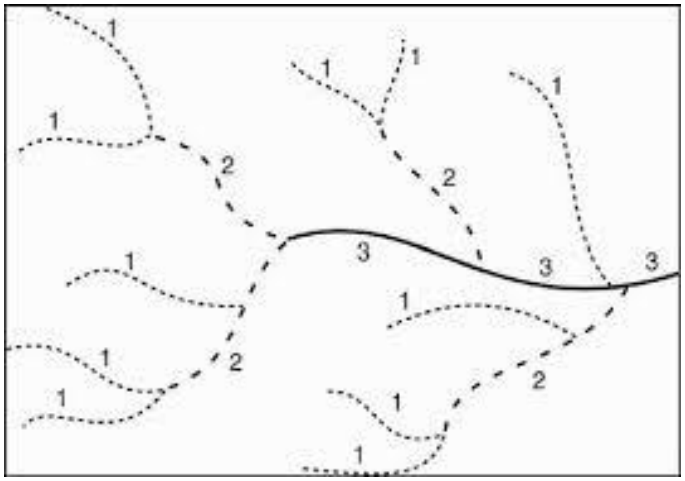


Figure 8: The classification of stream orders from 1 to 3 (Strahler 1952)

4.3.2 Wetland and riparian indicators

Obligate wetland vegetation was utilised to determine the presence and border of wetland conditions along the banks of the river, as well as within its floodplain. The survey was undertaken by means of a lateral transect at the abstraction site, from the water's edge up to the border of the riparian zone. Soil samples were used to determine the border and also to confirm the presence of wetland soils where obligate wetland vegetation indicated wetland conditions (Appendix C). Soil samples were investigated for the presence of anaerobic evidence which characterises wetland soils.

Soil samples taken along the bank of the Sand River indicate a permanent zone of wetness along the marginal zone (water's edge) and is considered that saturated soil conditions exist year-round (Appendix C). These wetland conditions steadily decrease up the bank but it was clear that a seasonal zone of wetness still exists along the banks and seepage areas are also present. Temporary wetland conditions were also observed at the upper boundary of the upper zone and this indicated the border of wetland conditions. The banks and floodplain of the river is quite steep here and consequently an extensive floodplain is absent. The floodplain is narrow, steep and without any visible wetland conditions. The edge between this narrow floodplain and the surrounding terrestrial environment is visible where the steep slope levels off into the surrounding plain and surface dolerite outcrops, indicating the edge of the riparian zone. These wetland conditions, zonation and geomorphology of the riverbank is largely natural and stable here. However, the weir situated immediately downstream has clearly resulted in some modification of the riverbank, especially the baseflow level. This weir causes elevation of the baseflow level of the river, which essentially submerges portions of the banks and in so doing alters the geomorphology of the river and its flow and flooding regime.

Figure 9: Aerial view of the abstraction works which clearly indicates the effect the weir (red) has had on the river and its banks when looking upstream and downstream of this weir (Google Earth 2021).

4.3.3 Classification of wetland systems

The Sand River at the site can be classified into a specific wetland type.

The wetland conditions associated with the banks of the Sand River can be characterised as a channel wetland system (SANBI 2009):

"An open conduit with clearly defined margins that (i) continuously or periodically contains flowing water, or (ii) forms a connecting link between two water bodies. Dominant water sources include concentrated surface flow from upstream channels and tributaries, diffuse surface flow or interflow, and/or groundwater flow. Water moves through the system as concentrated flow and usually exits as such but can exit as diffuse surface flow because of a sudden change in gradient. Unidirectional channel-contained horizontal flow characterises the hydrodynamic nature of these units. Note that, for purposes of the classification system, channels generally refer to rivers or streams (including those that have been canalised) that are subject to concentrated flow on a continuous basis or periodically during flooding, as opposed to being characterised by diffuse flow (see unchannelled valley-bottom wetland). As a result of the erosive forces associated with concentrated flow, channels characteristically have relatively obvious active channel banks. An active channel is a channel that is inundated at sufficiently regular intervals to maintain channel form and keep the channel free of established terrestrial vegetation. These channels are typically filled to capacity during bankfull discharge (i.e. during the annual flood, except for intermittent rivers that do not flood annually)."

This accurately described the wetland conditions within and around the Sand River. Wetland conditions are clearly present within the main channel and forms a channel wetland system, decreasing along the banks from the water's edge up to the edge of the riparian zone (Appendix A: Map 1).

4.3.4 Description of the riparian zones of watercourses

River systems can be divided into different riparian zones within the lateral section of the system. These zones are as follows:

The marginal zone is the lowest zone and is always present in river systems while the other two zones may not always be present. The zone is situated from the water level at low flow, if present, up to the features that are hydrologically activated for the most of the year (Figure 10). The marginal zone of the Sand River is relatively uniform at the site and is relatively narrow with a width of 1 to 2 meters. The marginal zone is stable and natural but has been substantially modified as a result of the downstream weir. This weir has essentially elevated the marginal zone and it is highly likely that the marginal zone would naturally have been broader with a much more diverse geomorphology. The zone is however currently stable, dominated by indigenous riparian vegetation and functioning naturally. Vegetation is dominated by reeds and other wetland plants adapted to waterlogged soils and partial submergence.

The lower zone is characterised by seasonal features and extends from the marginal zone up to an area of marked elevation. This area may be accompanied by a change in species distribution patterns. The lower zone consists of geomorphic features that are activated on a seasonal basis (Figure 10). The lower zone of the river at the proposed site consists of a relatively steep bank which is normally associated with larger watercourses where significant flooding events are common. As with the marginal zone, the downstream weir would also have resulted in significant modification of the lower zone, at least the lower portion. The weir elevates the baseflow of the river, in so doing submerging the lower portion of the lower zone. The lower zone would therefore be narrower, with a more simplified geomorphology. This is also quite clear when looking at the section of the river downstream of the weir. The vegetation is dominated by reeds and trees. This also illustrates the modification caused by the weir, naturally the lower zone would have contained a more diverse vegetation community with grasses and wetland plants dominating. The weir has now narrowed the zone and reeds (being more characteristic of the marginal zone) and trees (being more characteristic of the upper zone) dominates.

The upper zone is characterised by ephemeral features as well as the presence of both riparian and terrestrial species. The zone extends from the lower zone to the riparian corridor. The upper zone contains geomorphic features that are hydrologically activated on an ephemeral basis (Figure 10). The upper zone of the Sand River is visible as a decrease from a steep slope to a more moderate slope and is dominated by dense tree and shrub vegetation. The upper zone is also the least modified in terms of the impacts caused by the downstream weir. The extent of the upper zone may have decreased somewhat but for the most part is still the same.

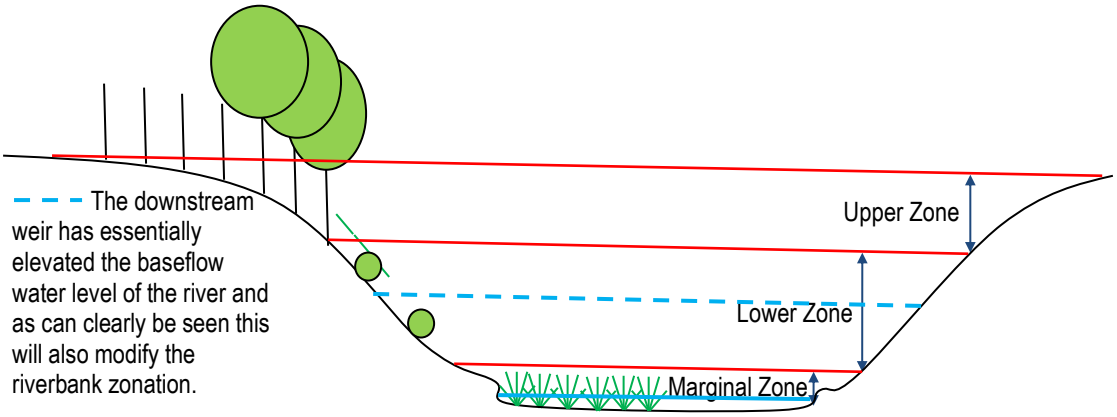


Figure 10: Illustration showing the different riparian zones of the Sand River at the site. This also illustrates the effect that the downstream has in elevating the baseflow level and so modifying the zonation of the riverbank.

4.3.5 Current impacts on the affected wetlands

The Sand River at the proposed abstraction site has been affected by several significant impacts which has caused moderate modification of the system. The river has been affected by the Cyferfontein Dam, a large off-channel storage dam and associated weir which would undoubtedly have altered the flow and flooding regime (Appendix A: Map 1). These are regarded as the most prominent impacts in the immediate area. Upstream and the surrounding catchment also contains numerous significant impacts, mostly associated with agricultural crop cultivation, including fertiliser and herbicide runoff, erosion and increased sediment loads and infestation by exotic weeds.

The off-channel Cyferfontein storage dam, abstracts water from the main channel and in so doing decreases the baseflow of the river which alters the flow regime significantly. The weir associated with this dam also act as flow barrier, and although not as significant as an in-channel storage dam, would also cause retardation of flow and obstruct flooding events and would therefore impact on the flow and flooding regime of the river. The weir has clearly also resulted in a significant change in the riparian zonation of the river. The baseflow water level has been elevated by the weir, essentially submerging the original and natural marginal zone and lower portion of the lower zone. These zones have now moved up the bank of the river, thus narrowing the original zones and significantly modifying the banks of the river. As can be seen, the weir has clearly had a significant impact on the river.

Associated with the weir and Cyferfontein Dam is also a Water Treatment Works (WTW) and associated pump stations, infrastructure and roads. These have also resulted in disturbance and localised impacts but has, largely, been stabilised and no longer contributes significant impacts on the river.

Figure 11: Impacts at and around the site is clearly visible from aerial images (Google Earth 2021). The weir (red) as well as WTW and off-channel Cyferfontein Dam is evident.

Figure 12: The downstream weir (red) and WTW has a significant impact on the river at the site.

Figure 13: The weir clearly results in an elevation of the baseflow level of the river. The banks would naturally have been much broader and more diverse in terms of habitat and geomorphology.

Several upstream impacts will also affect the condition of the river:

A few low-water dirt road crossings occur over the river upstream of the site. These will also act as flow obstructions though not to the same extent as the weir but will still affect the flow and flooding regime.

The upstream areas are subjected to extensive dryland crop cultivation and this would undoubtedly also contribute significant impacts on the river. These fields clear the natural vegetation and significantly contributes to increased runoff velocity which in turn increases erosion and sedimentation of watercourses. Also associated with this is fertiliser, pesticide and herbicide runoff and its effect on water quality.

Sections of the river upstream of the site also contains numerous exotic trees which may form dense stands in some areas. It will have a limited impact on the river at the site but may influence baseflow as a result of high evapotranspiration.

Several significant impacts has quite significantly affected the river at the site and the bed and bank morphology has also been significantly modified, mostly as a result of the downstream weir. Despite the modifications affecting the Sand River, it is still regarded as a highly sensitive system providing numerous vital ecosystem functions including water transportation, aquatic and wetland habitat, flood attenuation and bioremediation functions.

4.3.6 Condition and importance of the affected watercourses

The determination of the condition of the Sand River at the proposed abstraction site will be based on an overall determination of the Index of Habitat Integrity (IHI) (Appendix D). This will also take into account upstream impacts as well as impacts within the catchment. This is considered to give a good representation of the condition of this system. The IHI will be taken as representative of the Present Ecological State (PES) of the Sand River system

Table 3 refers to the determination and categorisation of the Present Ecological State (PES; health or integrity) of various biophysical attributes of rivers relative to the natural or close to the natural reference condition. The purpose of the EcoClassification process is to gain insights and understanding into the causes and sources of the deviation of the PES of biophysical attributes from the reference condition. This provides the information needed to derive desirable and attainable future ecological objectives for the river (Kleynhans & Louw 2007).

Table 4 refers to the Ecological Importance and Sensitivity (EIS) of wetlands. "Ecological importance" of a water resource is an expression of its importance to the maintenance of ecological diversity and functioning on local and wider scales. "Ecological sensitivity" refers to the system's ability to resist disturbance and its capability to recover from disturbance once it has occurred. The Ecological Importance and Sensitivity (EIS) provides a guideline for determination of the Ecological Management Class (EMC).

Table 3: Ecological categories for Present Ecological Status (PES).

Ecological Category	Description
A	Unmodified, natural
B	Largely natural with few modifications. A small change in natural habitats and biota may have taken place but the ecosystem functions are essentially unchanged.
C	Moderately modified. Loss and change of natural habitat and biota have occurred, but the basic ecosystem functions are still predominately unchanged.
D	Largely modified. A large loss of natural habitat, biota and basic ecosystem function has occurred.
E	Seriously modified. The loss of natural habitat, biota and basic ecosystem functions is extensive.
F	Critically/Extremely modified. Modifications have reached a critical level and the system has been modified completely with an almost complete loss of natural habitat and biota. In the worst instances the basic ecosystem functions have been destroyed and the changes are irreversible.

Table 4: Ecological importance and sensitivity categories.

Ecological Importance and Sensitivity Category (EIS)	Range of Median	Recommended Ecological Management Class
Very High Floodplains that are considered ecologically important and sensitive on a national or even international level. The biodiversity of these floodplains is usually very sensitive to flow and habitat modifications. They play a major role in moderating the quantity and quality of water of major rivers.	>3 and <=4	A
High Floodplains that are considered to be ecologically important and sensitive. The biodiversity of these floodplains may be sensitive to flow and habitat modifications. They play a role	>2 and <=3	B

in moderating the quantity and quality of water of major rivers.		
Moderate Floodplains that are considered to be ecologically important and sensitive on a provincial or local scale. The biodiversity of these floodplains is not usually sensitive to flow and habitat modifications. They play a small role in moderating the quantity and quality of water of major rivers.	>1 and <=2	C
Low/marginal Floodplains that are not ecologically important and sensitive at any scale. The biodiversity of these floodplains is ubiquitous and not sensitive to flow and habitat modifications. They play an insignificant role in moderating the quantity and quality of water of major rivers.	>0 and <=1	D

According to Kleynhans (2000) a desktop assessment of the Sand River is considered to have a PES of Category C: Moderately Modified. On site observations indicate that this is relatively accurate as this study has also calculated the Sand River as having a PES of Category C: Moderately Modified. Loss and change of natural habitat and biota have occurred, but the basic ecosystem functions are still predominately unchanged. The system therefore still provides vital functions including water transportation, storm water, instream and riparian habitat and groundwater recharge. The entire system should therefore still be considered as sensitive and the proposed abstraction works should not lead to any further alteration to it.

The Sand River which will be affected by the abstraction works is still natural to a significant extent although moderately modified by large impacts associated with the downstream weir, Cyferfontein Dam and upstream dryland crop cultivation. An Index of Habitat Integrity (IHI) was conducted and indicated that the river has an Instream and Riparian IHI of Category C: Moderately Modified. A summary of these results are included in Appendix D.

The EI&S of the Sand River has been rated as being Moderate: Floodplains that are considered to be ecologically important and sensitive on a provincial or local scale. The biodiversity of these floodplains is not usually sensitive to flow and habitat modifications. They play a small role in moderating the quantity and quality of water of major rivers.

4.3.7 Site specific descriptions

The proposed abstraction works within the Sand River is situated adjacent to the off-channel Cyferfontein Dam, upstream of the weir in the Sand River (Appendix A: Map 1). A short description will be provided of the riparian vegetation along the river at the site and its general condition.

Where FW or OW is indicated it refers to Facultative or Obligate Wetland species. A facultative wetland species is often associated with wetlands but is also able to occur in non-wetland areas. Obligate wetland species are confined to wetlands and are only able to occur in wetlands. They are therefore reliable indicators of wetland conditions. Field observations over time as well as the following sources were used to determine FW and OW species:

- Marnewecke, G. & Kotze, D. 1999. Appendix W6: Guidelines for delineation of wetland boundary and wetland zones. In: MacKay (Ed.), H. Resource directed measures for

protection of water resources: wetland ecosystems. Department of Water Affairs and Forestry, Pretoria.

- DWAF. 2008. Updated manual for the identification and delineation of wetlands and riparian areas, prepared by M.Rountree, A.L. Batchelor, J. MacKenzie and D. Hoare. Stream Flow Reduction Activities, Department of Water Affairs and Forestry, Pretoria, South Africa.

Table 5: Description of the specific abstraction site within the Sand River (FW – Facultative wetland species, OW – Obligate wetland species, * - Exotic species).

Watercourse name:	**Coordinates of site:**	**Order:**
Sand River (Appendix A: Map 1)	S 28.243102°, E 27.655011°	Second Order

Description of watercourse at proposed site:

The proposed site for the construction of a new abstraction works, will be situated on the banks and within the main channel of the Sand River, a short distance (approximately 200 meters) upstream of the existing weir in the river. The river channel is clearly defined and flows from north east to south west past the proposed site. The channel has a width of 60 meters here, a consequence of the weir which cause the damming of the main channel. This is especially evident when looking downstream of the weir, where the river has an approximate width of 10 meters. This should also illustrate the impact that the weir has had on the river in terms of modifying the bank structure. Essentially the marginal zone has become elevated, the lower zone is narrower and is not much lower than the upper zone. Also refer to Section 4.3.4 for a description of the current impacts on the river.

As indicated, the bank structure here is substantially modified by the downstream weir. The marginal zone is quite narrow (Approximately 1 meter) and fairly steep and transitions into the lower zone without any visible change in geomorphology, though is distinguishable in terms of the vegetation composition. The marginal and lower zone has been narrowed and blended into each other by the elevated baseflow level caused by the downstream weir. The upper zone is more natural and more easily distinguished. The gradient of the upper zone decreases substantially from the steep lower zone to a more moderate gradient. From the upper zone the floodplain of the river extends up a moderate slope and consequently is also quite narrow, being approximately 10 meters broad. The floodplain also levels off into the surrounding terrestrial environment and the outcrop of weathered dolerite also reliably indicates the edge of the riparian zone.

Obligate wetland vegetation dominates the marginal zone. While reeds dominate, obligate wetland sedges and herbaceous plants are also present. The lower zone also contains obligate wetland reeds, mostly a result of the elevation of the zone due to the downstream weir. Invasive trees and shrubs are also abundant in the lower zone and indicates significant disturbance of the riverbank. Obligate wetland grasses (*Imperata cylindrica*) is also abundant, especially where groundwater seepage was noted. Both the marginal and lower zones can therefore be regarded as containing clear wetland conditions. While the marginal zone indicates a perennial zone of wetness the lower is indicative of only seasonal wetland conditions. The upper zone also contains an abundance of invasive trees, but which also transitions into a well-developed grass layer in the floodplain. This grass layer is dominated by terrestrial species although scattered obligate wetland sedges were also noted. Soil samples also indicated that the upper zone contains a temporary zone of wetness which therefore confirms wetland conditions but is also taken as the border of wetland conditions.

Dominant plant species:

Marginal Zone: *Phragmites australis* (OW), *Cyperus marginatus* (OW), *Persicaria lapathifolia* (OW), **Paspalum dilatatum* (FW), **Rumex crispus.*

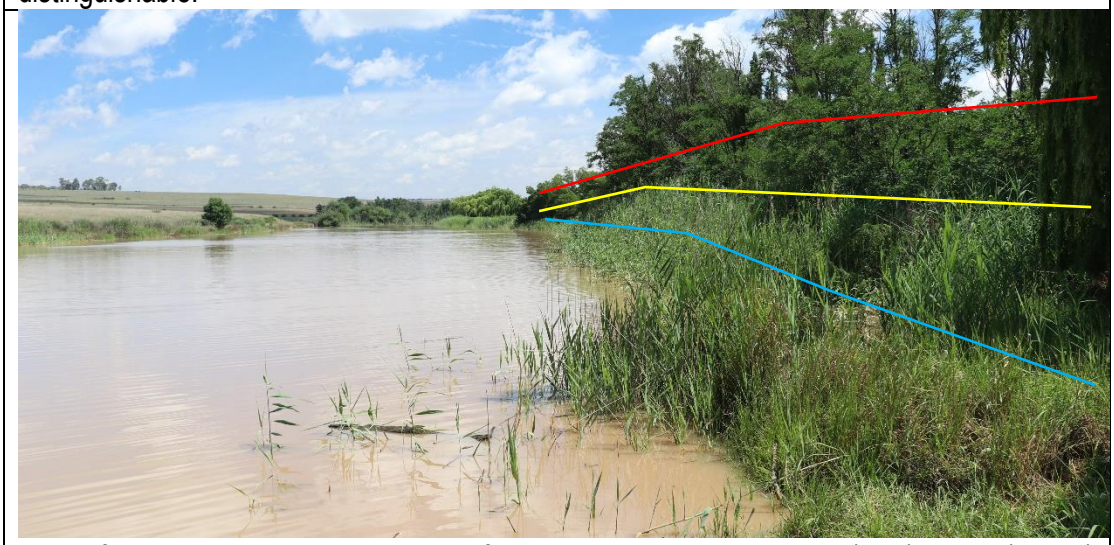
Lower Zone: **Ligustrum lucidum, *Robinia pseudoacacia, Salix babylonica, *Pyracantha angustifolia, *Fraxinus americana, *Oenothera rosea, Phragmites australis* (OW), **Salix fragilis, Imperata cylindirca* (OW).

Upper Zone: *Asparagus larcinus, Searsia pyroides, *Verbena tenuisecta, Haplocarpha scaposa, Cymbopogon pospischillii, Bromus leptocladus, Cyperus marginatus* (OW), *Setaria sphacelata* (FW), *Cynodon dactylon, *Verbena bonariensis, Hypoxis rigidula*.

View of the proposed site for the construction of the abstraction works.

Dominance of invasive trees are quite prominent along the banks and floodplain of the river at the site.

The marginal zone (blue) of the river at the site is clearly quite modified and narrowed by the downstream weir (red). The marginal and lower zones also blend without being readily distinguishable.



View of the zonation along the banks of the river at the site, marginal (blue), lower (yellow) and upper (red). This is considered quite heavily modified form the natural bank structure.

The upper zone is also dominated by trees and shrubs but which transitions into a well-developed grass layer. It is also notable that the gradient of the upper zone decreases substantially from the lower zone (red).

The edge of the riaparian zone is visible as a levelling off of the slopes into the surrounding terrestrial environment, and also indicated where dolerite outcrops occur.

4.4 Risk Assessment

A Risk Assessment for the proposed abstraction works within the Sand River has been undertaken according to the Department of Water & Sanitation's requirements for risk assessment and the provisional Risk Assessment Matrix for Section 21(c) & (i) water use (Appendix E). The abstraction works will also require the construction of a coffer dam and extensive disturbance of the banks and consequently several significant impacts are anticipated.

The majority of impacts should occur during the construction phase and should largely be limited to it, provided that adequate rehabilitation and monitoring is undertaken after construction has been completed.

The initial impacts of construction will entail the removal of riparian vegetation and substantial disturbance of the banks of the river at the abstraction site. This will destabilise the bank of the river and will result in erosion of the bank and sedimentation of the river. As a result disturbance of the banks should be kept to a minimum and erosion remediated where it occurs. Removal of vegetation should also be kept to a minimum. Adequate design of the abstraction works, monitoring of erosion and the implementation of erosion prevention structures will therefore be of high importance. The watercourse bed and bank morphology should also be re-instated as far as possible, which will also speed up the stabilisation of the bed and banks as it will resemble the surrounding river morphology and therefore won't be subjected to additional erosion as opposed to depressions or extrusions which will be subjected to erosion during flooding. Where steep banks occur and erosion is evidently problematic it is recommended that geotextiles be utilised to stabilise soils. Available options include contouring, berms, gabions and geotextile netting. The disturbance caused by construction will also increase the establishment of exotic weeds and invasive species. It will therefore also be important to monitor and eradicate exotic weeds and invasive species where they establish. The disturbance of the banks and impacts associated with it should however be limited to the construction phase, as long as adequate rehabilitation is undertaken. When excavating or disturbing the banks the upper 30 cm, or topsoil, should be removed together with the vegetation and stored as sods on the site. These should then be replaced in disturbed areas requiring rehabilitation. After rehabilitation any excess soil or material should be removed and disposed of at a registered disposal facility. A comprehensive

rehabilitation and monitoring plan should be compiled and implemented in order to ensure the riverbanks are stabilised following construction. Should adequate mitigation be implemented, this activity should retain a moderate risk of impacts on the river.

The construction works will also require the construction of a temporary coffer dam which will allow for dewatering a portion of the main channel of the river to allow for construction to take place. This will also have substantial impacts on the river. Initial impacts will be high when disturbance and infilling of the bed is undertaken. This is likely to release high volumes of sediment into the river. During construction this coffer dam will also require continuous dewatering in order to ensure that the construction area remains dry for construction. This water infiltration is also highly likely to become contaminated by construction waste such as cement, oils and grease and similar construction materials. It would therefore be important that the water infiltrating into the coffer dam not simply be pumped back into the river but should first be pumped into a small attenuation area on the banks and then allowed to infiltrate back into the river, leaving contaminants, including sediments, behind in the attenuation area. The dismantling of the coffer dam will again result in substantial impacts, mostly associated again with sediment release into the river. It should be clear that the construction of the coffer dam will result in at least a moderate risk of impacting on the river.

The abstraction works will entail the abstraction of significant volumes of water from the river. Normally, this will result in a significant risk on the watersource. However, in this instance abstraction is already taking place and the impact is therefore already present. The proposed abstraction works will simply replace the existing infrastructure and this activity was therefore not been included in the assessment.

Construction which will be associated with the abstraction works but will not directly affect the river is a laydown area, access road and associated construction disturbance. This will entail a low risk, as long as adequate rehabilitation of disturbed areas are undertaken. Access to the construction site should be limited to a single access road.

It should be clear that the proposed abstraction works will result in significant impacts on the banks and main channel of the river. A comprehensive monitoring programme should therefore be followed to quantify impacts and recommend mitigation. Such monitoring should include quarterly water quality sampling, sediment release (turbidity), Index of Habitat Integrity and SASS5 or a combination thereof.

Taking into consideration all of the above and provided that adequate mitigation as recommended is implemented at the site, the proposed abstraction works should be limited to a moderate risk activity.

Moderate Risks: Risk and impact on watercourses are notable and require mitigation measures on a higher level.

Low Risks: Acceptable as is or consider requirement for mitigation. Impact to watercourses and resource quality small and easily mitigated.

Mitigation as recommended should be implemented as far as possible.

For the complete risk assessment please refer to Appendix E.

No.	Phases	Activity	Aspect	Impact	Risk Rating	Confidence level	Control measures
1	Mostly Construction but extending there after	Construction of new abstraction works in the Sand River, including construction of a coffer dam.	Excavation of sediment from the main channel.	Construction will remove riparian vegetation and disturb the riverbanks which will result in destabilisation of the riverbank and increase the sediment load. Increased establishment of exotic weeds and invaders due to disturbance caused by construction is also probable.	**M**	80	This impact will occur mainly during the construction phase but will only cease once the riverbank has been stabilised and adequate rehabilitation of the riverbank has been completed. Mitigation as stipulated within Section 4.4 should be implemented in order to reduce the anticipated impacts associated with the disturbance of the riverbank.
	Mostly Operational Phase		Construction of a coffer dam and continuous dewatering of construction area.	The initial construction of the coffer dam will result in substantial impacts, especially in terms of sediment release and disturbance of the riverbed. Continuous dewatering of the coffer dam will in itself also result in substantial impacts (sediment release, contamination by construction materials).	**M**	80	This impact will also largely be confined to the construction phase but will only cease once the coffer dam has successfully been removed and rehabilitated. Adequate mitigation should include the implementation of attenuation areas.
	Mostly Operational Phase		Construction of an access road and construction laydown area.	Construction of an access road construction laydown area along the floodplain will also cause disturbance although on a local scale. These areas will require the removal of riparian vegetation. Increased erosion, sediment load and exotic weed establishment is also likely.	**L**	80	The impact will be largely confined to the construction phase as long as the access road and laydown area is rehabilitated afterwards. This is likely reversible impact and therefore has a low risk. It is still important that adequate rehabilitation and monitoring takes place. Mitigation as stipulated within Section 4.4 should be implemented in order to reduce the anticipated impacts associated with the abstraction works.

5. Ecological description of immediate area

Habitat diversity and species richness:
Habitat diversity is relatively high and represented by a varied topography including undulating plains, ridges as well as the Sand River, floodplain and varied habitats. Despite the variety of habitat, the species diversity is only regarded as moderate.

Presence of rare and endangered species:
Several protected species are known to occur in the surrounding area (Appendix B). Although large portions of the area has previously transformed, mostly as a result of the Cyferfontein Dam and associated structures and infrastructure, areas of remaining natural grassland are also still present. Notably a portion of grassland to the west of the dam contains a large proportion of protected species with a few also being regarded as being quite rare. These included *Aloe jeppeae, Asclepias stellifera, Euphorbia clavaroides, Amocharis coranica, Haemanthus montanus, Euphorbia pseudotuberosa*. All of these protected plant species will have a significant conservation value. In addition, a higher proportion or diversity of such protected species together in one area, will also contribute toward the conservation value of this area. Consequently, this portion of remaining natural grassland to the west of the Cyferfontein Dam is regarded as having a High conservation value. This area should therefore be regarded as a no-go area and avoided by the proposed development and any associated activities, i.e. laydown areas, stockpile yards and vehicle movement. Ample areas are available for construction and it should not be difficult to avoid this portion. Avoiding this area will also, by default, ensure the preservation of the protected plant species as listed above.

Ecological function:
The ecological functioning of the Sand River has been moderately modified though is still intact and provides ecological services in terms of water transportation, storm water, instream and riparian habitat and groundwater recharge.

The surrounding area has been transformed to a large extent and here the ecological function would also be impaired. However, areas of remaining natural grassland still perform important ecological functions in terms of sustaining the natural vegetation type and providing habitat to the natural fauna. Overall the ecological function of the area is therefore regarded as moderately intact.

Degree of rarity/conservation value:
According to Mucina & Rutherford (2006) the immediate surroundings consist of Central Free State Grassland (Gh 6). The vegetation type is currently listed as being of Least Concern (LC) according to the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) (Appendix A: Map 2). Although it is quite heavily affected by transformation for dryland crop cultivation, it is not yet considered as severe enough to be regarded a Threatened Ecosystem. This will therefore entail only a moderate conservation.

However, remaining natural grassland to the west of the Cyferfontein Dam contains a high proportion of protected species which will have a relatively high conservation value (Appendix A: Map 1).

The Sand River, its banks and the floodplain remain highly sensitive in spite of their moderately modified character and therefore has a high conservation value.

Percentage ground cover:
The overall percentage ground cover is considered to be moderate. Areas of disturbance around the dam and other structures and infrastructures have a low percentage vegetation cover while those portions of remaining grassland have a high percentage vegetation cover. Therefore, overall, the area is regarded to have a moderate percentage vegetation cover.

Vegetation structure:
The vegetation structure of surrounding natural vegetation is still largely natural although exotic weeds, shrubs and trees do modify this where they occur.

Infestation with exotic weeds and invader plants:
Exotic weeds and invaders are abundant and quite problematic, especially along the banks of the river where invasive tree species dominate (Appendix B).

Degree of grazing/browsing impact:
The area may from time to time be used as grazing by domestic livestock but high levels of overgrazing is not evident and this is considered as only being moderate overall.

Signs of erosion:
Low levels of erosion may be present along the dirt tracks and areas of disturbance around structures. However, overall, the area is well vegetated, soils stable and without prominent erosion. The erosion in the area is therefore only regarded as moderate.

Terrestrial animals:
Signs and tracks of mammals are abundant along the banks of the Sand River and adjacent areas. Watercourses provide a high biomass, perennial foraging and a large prey base and are therefore able to sustain a larger and more diverse mammal population. The mammal population around the site is however anticipated to be somewhat modified from the natural condition. The proximity of the existing water works and frequent human activities, as well as the generally degraded condition of the available habitat, will also affect the mammal population on the site. As a consequence it is also considered unlikely that any species of conservation concern would remain in the area. These species normally require pristine habitat and are sensitive to human induced disturbances. The likelihood that such a species may occur can however not be discounted.

Table 6: Biodiversity Sensitivity Rating for the proposed abstraction works in the Sand River.

	Low (3)	Medium (2)	High (1)
Vegetation characteristics			
Habitat diversity & Species richness		2	
Presence of rare and endangered species		2	
Ecological function		2	
Uniqueness/conservation value			1
Vegetation condition			
Percentage ground cover		2	
Vegetation structure		2	
Infestation with exotic weeds and invader plants or encroachers	3		
Degree of grazing/browsing impact		2	
Signs of erosion		2	
Terrestrial animal characteristics			
Presence of rare and endangered species		2	
Sub total	3	16	1
Total		20	

6. Biodiversity sensitivity rating (BSR)

Table 7: Interpretation of Biodiversity Sensitivity Rating.

Site	Score	Site Rating	Value
Cyferfontein Dam Abstraction Works	20	Good Condition	2

7. Discussion and conclusions (Appendix A: Map 1 - 3)

The site proposed for the abstraction works within the Sand River has been rated as being in a good condition. This is not so much as a result of the area still being largely natural but is a result of the Sand River still being regarded as a sensitive system and that portions of remaining grassland containing a high abundance of protected plant species.

The proposed abstraction works will take place within the Sand River which is located at the Cyferfontein Dam situated approximately 9 km to the north of the small town of Senekal (Appendix A: Map 1). The Cyferfontein Dam is an off-channel storage dam which is therefore not located within the channel of the Sand River, but adjacent to it. A weir is located in the river, which ensures the containment of some flow, where an abstraction point is then situated and water pumped to the Cyferfontein Dam. The infrastructure at this dam is no longer sufficient to supply the town with potable water and the proposed construction will entail a new abstraction point in the main channel of the river (this will also require the temporary construction of a coffer dam). Although the current infrastructure, weir and off-channel dam all contribute to some modification of the system, the riparian zone, floodplain and wetland areas are all still natural and provide vital ecological functions.

According to Mucina & Rutherford (2006) the immediate surroundings consist of Central Free State Grassland (Gh 6). The vegetation type is currently listed as being of Least Concern (LC) according to the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) (Appendix A: Map 2). Although it is quite heavily affected by transformation for dryland crop cultivation, it is not yet considered as severe enough to be regarded a Threatened Ecosystem. Portions of this vegetation type around the construction areas will therefore not have a high conservation value, however, elements of conservation concern may still be present in natural areas. According to the Free State Province Biodiversity Management Plan (2015) the site for the proposed abstraction works is listed as being an Ecological Support Areas 1 & 2 (ESA 1 & 2) (Appendix A: Map 3). This indicates that the area has been degraded to varying degrees by the surrounding landuse but forms part of the functioning of the Sand River and as a result does provide important functions in the support of this system.

The areas surrounding the proposed abstraction works has been degraded and transformed to varying degrees, but with patches of natural vegetation also being present. This is confirmed, to some degree, by the National Biodiversity Assessment (2018), which indicates that the Cyferfontein Dam and areas to the south of it is transformed and no longer regarded as consisting of natural vegetation (Appendix A: Map 2). The areas along the floodplain of the river and portions adjacent to the abstraction works do however still consist of natural vegetation but with several areas being degraded by construction and the existing water works. It should therefore be evident that the surroundings has been degraded and transformed to a significant degree. A portion of remaining natural vegetation has however been observed to the west of the dam and here elements of conservation value was also identified.

The majority of the site and surroundings have been degraded. Remaining natural vegetation is dominated by pioneer species and exotic weeds which confirm a degraded condition. These areas are considered of Low conservation value. Furthermore, the natural vegetation type in this area, Central Free State Grassland, is currently of Least Concern (LC) and therefore does not contribute toward the conservation value of natural vegetation (Appendix A: Map 2). This is also confirmed by the Free State Biodiversity Management Plan which regards the area as an Ecological Support Area 1 & 2 which, although of low conservation value, does still aid in the

functioning of the Sand River (Appendix A: Map 3). However, the exception to the above, is a portion of remaining natural grassland to the west of the Cyferfontein Dam (Appendix A: Map 1). Here, a substantial species diversity is present with many protected species and somewhat rarer species also being present. As a consequence, this area is regarded as having a High conservation value and should be excluded from the development and treated as a no-go area. It should be avoided by the proposed development as well as any associated activities, i.e. laydown areas, stockpile yards and vehicle movement. Ample areas are available for construction and it should not be difficult to avoid this portion. The Sand River itself as well as the associated floodplain and wetland areas should be regarded as having a Very High conservation value.

Signs and tracks of mammals are abundant along the banks of the Sand River and adjacent areas. Watercourses provide a high biomass, perennial foraging and a large prey base and are therefore able to sustain a larger and more diverse mammal population. The mammal population around the site is however anticipated to be somewhat modified from the natural condition. The proximity of the existing water works and frequent human activities, as well as the generally degraded condition of the available habitat, will also affect the mammal population on the site. As a consequence it is also considered unlikely that any species of conservation concern would remain in the area. These species normally require pristine habitat and are sensitive to human induced disturbances. The likelihood that such a species may occur can however not be discounted.

The proposed abstraction works will affect a portion of the main channel of the Sand River (Appendix A: Map 1). These impacts are anticipated to be most pronounced during construction and immediately thereafter.

Soil samples taken along the bank of the Sand River indicate a permanent zone of wetness along the marginal zone (water's edge) and is considered that saturated soil conditions exist year-round (Appendix C). These wetland conditions steadily decrease up the bank but it was clear that a seasonal zone of wetness still exists along the banks and seepage areas are also present. Temporary wetland conditions were also observed at the upper boundary of the upper zone and this indicated the border of wetland conditions. The banks and floodplain of the river is quite steep here and consequently an extensive floodplain is absent. The floodplain is narrow, steep and without any visible wetland conditions. The edge between this narrow floodplain and the surrounding terrestrial environment is visible where the steep slope levels off into the surrounding plain and surface dolerite outcrops, indicating the edge of the riparian zone. These wetland conditions, zonation and geomorphology of the riverbank is largely natural and stable here. However, the weir situated immediately downstream has clearly resulted in some modification of the riverbank, especially the baseflow level. This weir causes elevation of the baseflow level of the river, which essentially submerges portions of the banks and in so doing alters the geomorphology of the river and its flow and flooding regime.

The Sand River at the proposed abstraction site has been affected by several significant impacts which has caused moderate modification of the system.

The off-channel Cyferfontein storage dam, abstracts water from the main channel and in so doing decreases the baseflow of the river which alters the flow regime significantly. The weir associated with this dam also act as flow barrier, and although not as significant as an in-channel storage dam, would also cause retardation of flow and obstruct flooding events and would therefore impact on the flow and flooding regime of the river. The weir has clearly also resulted in a

significant change in the riparian zonation of the river. The baseflow water level has been elevated by the weir, essentially submerging the original and natural marginal zone and lower portion of the lower zone. These zones have now moved up the bank of the river, thus narrowing the original zones and significantly modifying the banks of the river. As can be seen, the weir has clearly had a significant impact on the river.

The upstream areas are subjected to extensive dryland crop cultivation and this would undoubtedly also contribute significant impacts on the river. These fields clear the natural vegetation and significantly contributes to increased runoff velocity which in turn increases erosion and sedimentation of watercourses. Also associated with this is fertiliser, pesticide and herbicide runoff and its effect on water quality.

Several significant impacts has quite significantly affected the river at the site and the bed and bank morphology has also been significantly modified, mostly as a result of the downstream weir. Despite the modifications affecting the Sand River, it is still regarded as a highly sensitive system providing numerous vital ecosystem functions including water transportation, aquatic and wetland habitat, flood attenuation and bioremediation functions.

The Sand River which will be affected by the abstraction works is still natural to a significant extent although moderately modified by large impacts associated with the downstream weir, Cyferfontein Dam and upstream dryland crop cultivation. An Index of Habitat Integrity (IHI) was conducted and indicated that the river has an Instream and Riparian IHI of Category C: Moderately Modified. A summary of these results are included in Appendix D. The EI&S of the Sand River has been rated as being Moderate.

A Risk Assessment for the proposed abstraction works within the Sand River has been undertaken according to the Department of Water & Sanitation's requirements for risk assessment and the provisional Risk Assessment Matrix for Section 21(c) & (i) water use (Appendix E). The abstraction works will also require the construction of a coffer dam and extensive disturbance of the banks and consequently several significant impacts are anticipated.

The majority of impacts should occur during the construction phase and should largely be limited to it, provided that adequate rehabilitation and monitoring is undertaken after construction has been completed.

The initial impacts of construction will entail the removal of riparian vegetation and substantial disturbance of the banks of the river at the abstraction site. This will destabilise the bank of the river and will result in erosion of the bank and sedimentation of the river Should adequate mitigation be implemented, this activity should retain a moderate risk of impacts on the river.

The construction works will also require the construction of a temporary coffer dam which will allow for dewatering a portion of the main channel of the river to allow for construction to take place. This will also have substantial impacts on the river. Initial impacts will be high when disturbance and infilling of the bed is undertaken. This is likely to release high volumes of sediment into the river. During construction this coffer dam will also require continuous dewatering in order to ensure that the construction area remains dry for construction. This water infiltration is also highly likely to become contaminated by construction waste such as cement, oils and grease and similar construction materials. It should be clear that the construction of the coffer dam will result in at least a moderate risk of impacting on the river.

Construction which will be associated with the abstraction works but will not directly affect the river is a laydown area, access road and associated construction disturbance. This will entail a low risk, as long as adequate rehabilitation of disturbed areas are undertaken.

It should be clear that the proposed abstraction works will result in significant impacts on the banks and main channel of the river. A comprehensive monitoring programme should therefore be followed to quantify impacts and recommend mitigation. Such monitoring should include quarterly water quality sampling, sediment release (turbidity), Index of Habitat Integrity and SASS5 or a combination thereof.

Taking into consideration all of the above and provided that adequate mitigation as recommended is implemented at the site, the proposed abstraction works should be limited to a moderate risk activity.

8. Recommendations

- No littering must be allowed and all litter must be removed from the site.

- No hunting, harming, capturing or trapping must be allowed and this must be strictly prohibited.

- Monitoring of the construction of the abstraction works and compliance with recommended mitigation measures must take place.

- The necessary authorisations must be acquired from Department of Water and Sanitation (DWS) for the proposed construction of abstraction works within the Sand River as listed in Table 5 (Appendix A: Map 1).

- The portion of remaining natural grassland occurring to the west of the Cyferfontein Dam contains many protected plant species, is regarded as being of High Sensitivity and should be treated as no-go area (Appendix A: Map 1). It should be avoided by the proposed development as well as any associated activities, i.e. laydown areas, stockpile yards and vehicle movement. Ample areas are available for construction and it should not be difficult to avoid this portion.

Additional mitigation which should be considered in order to decrease the impact that the abstraction works will have on the Sand River include (Appendix A: Map 1):

- Disturbance of the banks should be kept to a minimum and erosion remediated where it occurs. Removal of vegetation should also be kept to a minimum.
- Access to the construction site should be limited to a single access road.
- Adequate design of the abstraction works, monitoring of erosion and the implementation of erosion prevention structures will therefore be of high importance.
- Where steep banks occur and erosion is evidently problematic it is recommended that geotextiles be utilised to stabilise soils. Available options include contouring, berms, gabions and geotextile netting.
- The watercourse bed and bank morphology should also be re-instated as far as possible, which will also speed up the stabilisation of the bed and banks as it will resemble the surrounding river morphology and therefore won't be subjected to additional erosion as opposed to depressions or extrusions which will be subjected to erosion during flooding.
- The disturbance caused by construction will also increase the establishment of exotic weeds and invasive species (Appendix B). It will therefore also be important to monitor and eradicate exotic weeds and invasive species where they establish.
- When excavating or disturbing the banks the upper 30 cm, or topsoil, should be removed together with the vegetation and stored as sods on the site. These should then be replaced in disturbed areas requiring rehabilitation.
- Dewatering of the coffer dam should also entail the implementation of a small attenuation area on the banks and then allowed to infiltrate back into the river, leaving contaminants, including sediments, behind in the attenuation area.
- Following the completion of the abstraction works, comprehensive rehabilitation of the banks, vegetation or wetland areas should be undertaken. It is important that riparian vegetation be re-established where they were removed. This can be attained by

removing sods of the indigenous sedges and grasses as listed for the river and replanting these in disturbed areas

- Rehabilitation of the construction site should also include the access road and any construction areas, laydown areas and construction yards.
- A comprehensive rehabilitation and monitoring plan should be compiled and implemented in order to ensure the riverbanks are stabilised following construction.
- After rehabilitation any excess soil or material should be removed and disposed of at a registered disposal facility.
- The proposed abstraction works will result in significant impacts on the banks and main channel of the river. A comprehensive monitoring programme should therefore be followed to quantify impacts and recommend mitigation. Such monitoring should include quarterly water quality sampling, sediment release (turbidity), Index of Habitat Integrity and SASS5 or a combination thereof.

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Annexure A: Maps

Wetland delineation map for the proposed abstraction works in the Sand River at the Cyferfontein Dam near the town of Senekal, Free State Province.

Legend:

- Abstraction Site
- Wetlands areas
- Riparian zone
- Highly Sensitive Grassland
- Sampling sites

Map Information

Spheroid: WGS 84

Quantum GIS

Scale: 1:5 000

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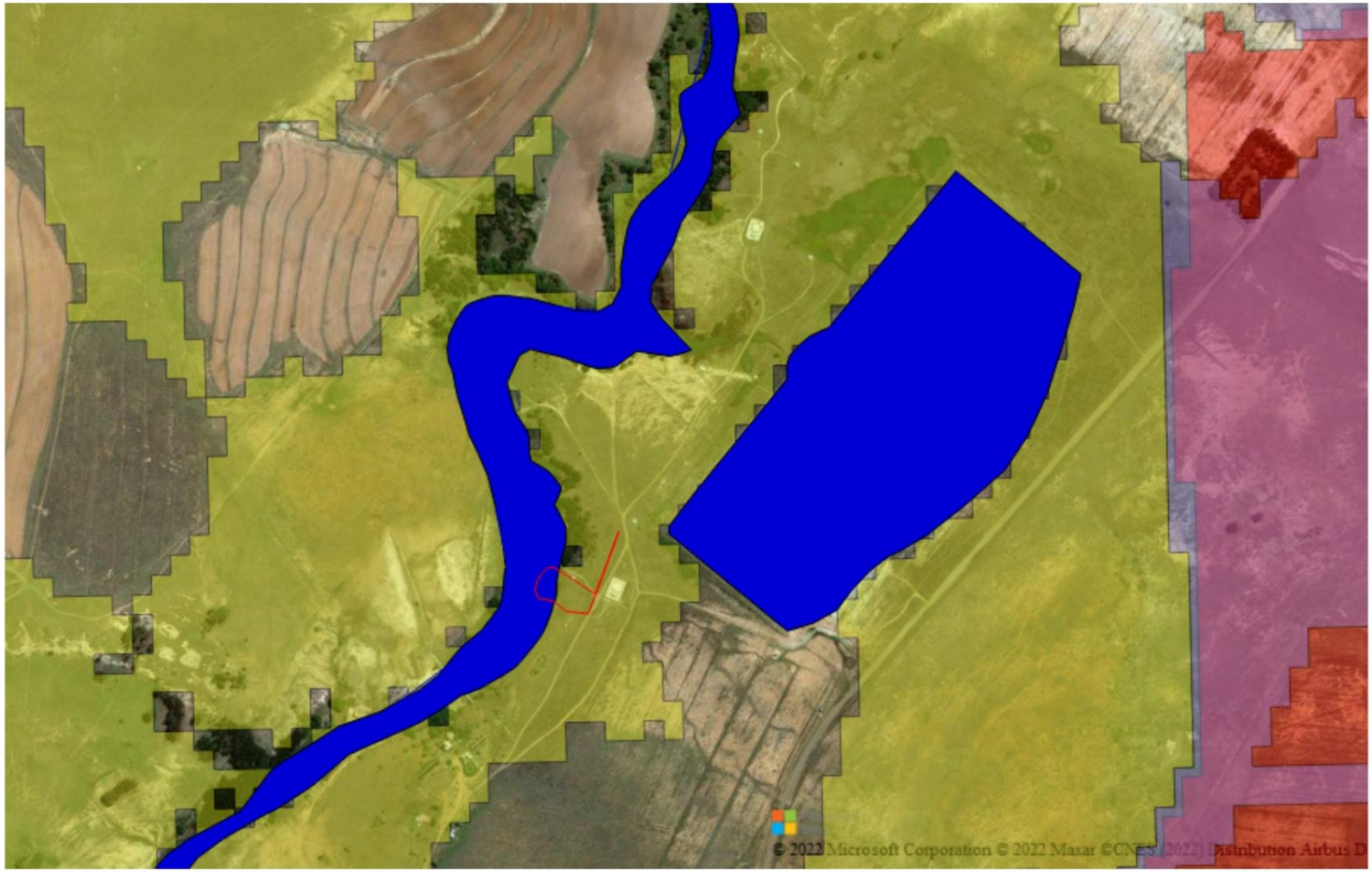
Map 1: Wetland delineation map for the proposed abstraction works in the Sand River. Note the adjacent Cyferfontein Dam, downstream weir and associated surface structures and disturbances. A portion of natural grassland to the west of the dam contains a high amount of protected plant species and is regarded as being highly sensitive. This area should be avoided and treated as a no-go area. The proposed abstraction works site is indicated which will include a portion of the main channel, the banks, which clearly contains wetland areas and the riparian zone which although devoid of wetland conditions, forms part of the floodplain of the river.

General ecology map for the proposed abstraction works in the Sand River at the Cyferfontein Dam near the town of Senekal, Free State Province.



Legend:

- Abstraction Site
- Threatened Ecosystems
- Wetlands and impoundments
- Central Free State Grassland
- Eastern FS Clay Grassland

Map Information

Spheroid: WGS 84

Quantum GIS

Scale: 1:10 000

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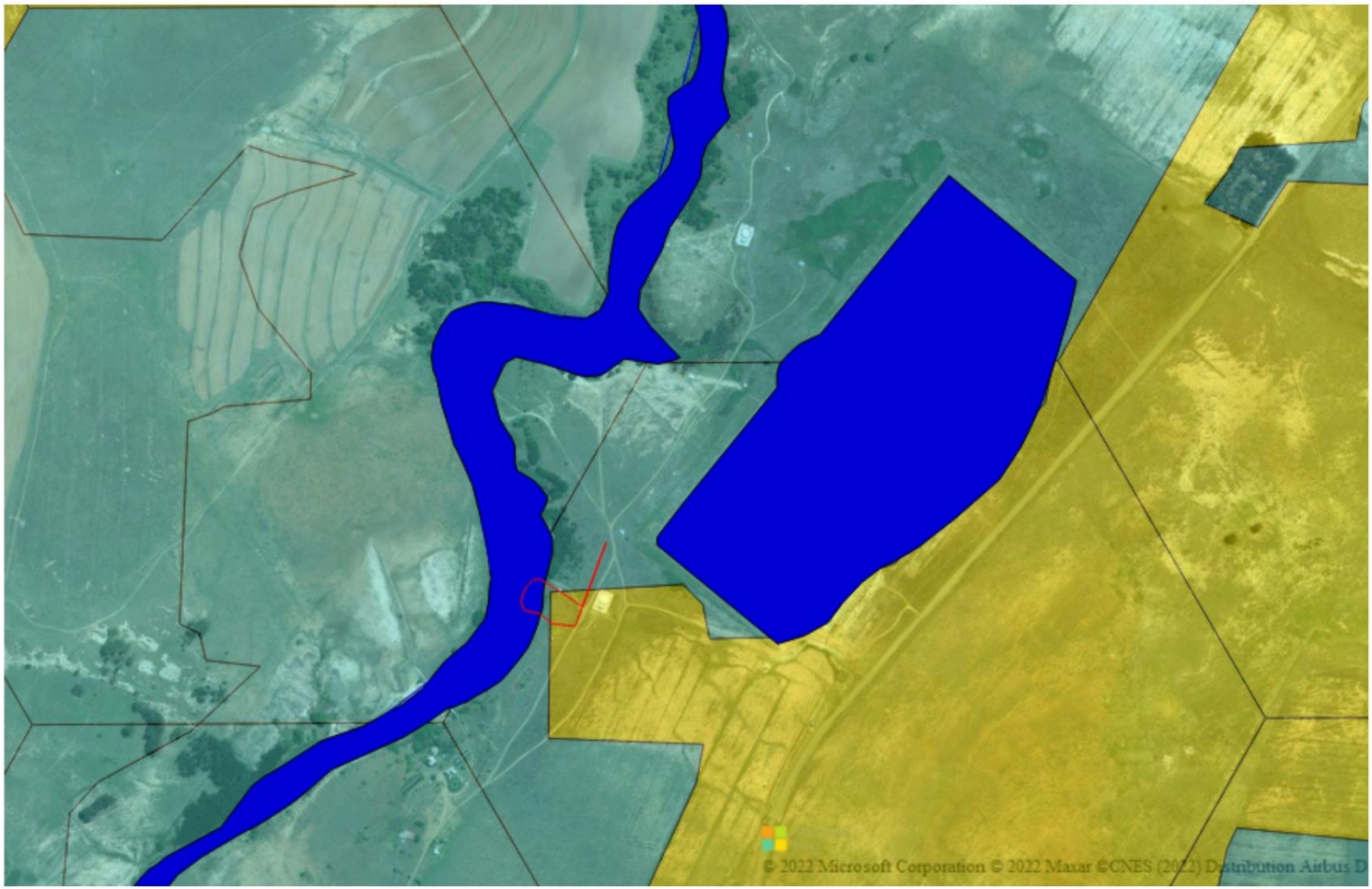
Map 2: General ecology map for the proposed abstraction works in the Sand River. The abstraction site is indicated as well as watercourses, wetlands and impoundments and areas of remaining natural vegetation. The site and surroundings consist of Central Free State Grassland which is not regarded as a Threatened Ecosystem although areas of remaining Eastern Free State Clay Grassland to the east of the site are listed as a Vulnerable vegetation type and therefore a Threatened Ecosystem.

Free State Biodiversity Plan map for the proposed abstraction works in the Sand River at the Cyferfontein Dam near the town of Senekal, Free State Province.



Legend:

- Abstraction Site
- Critical Biodiversity Area 1
- Critical Biodiversity Area 2
- Ecological Support Area 1
- Ecological Support Area 2
- Degraded
- Other
- Wetlands and impoundments

Map Information

Spheroid: WGS 84

Quantum GIS

Scale: 1:10 000

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Map 3: Free State Biodiversity Plan map for the proposed abstraction works in the Sand River. The abstraction site is indicated as well as watercourses, wetlands and impoundments. The site itself is considered an Ecological Support Area and functions in aid of the Sand River and its surrounding natural areas.

Appendix B: Species list

Species indicated with an * are exotic.

Protected species are coloured orange and Red Listed species red.

Species	Growth form
**Alternanthera pungens*	Herb
**Bromus catharticus*	Grass
**Cirsium vulgare*	Herb
**Conyza bonariensis*	Herb
**Cyclospermum leptophyllum*	Herb
**Cyperus eragrostis*	Sedge
**Fraxinus americana*	Tree
**Ligustrum lucidum*	Shrub
**Melia azedarach*	Tree
**Oenothera rosea*	Herb
**Paspalum dilatatum*	Grass
**Plantago lanceolata*	Herb
**Populus alba*	Tree
**Pseudognaphalium luteo-album*	Herb
**Pyracantha angustifolia*	Shrub
**Robinia pseudoacacia*	Tree
**Rumex crispus*	Herb
**Salix babylonica*	Tree
**Salix fragilis*	Tree
**Schkuhria pinata*	Herb
**Tagetes minuta*	Herb
**Verbena bonariensis*	Herb
**Verbena tenuisecta*	Herb
**Veronica anagalis-aquatica*	Herb
Agrostis lachnantha	Grass
Aloe jeppeae	Succulent
Ammocharis coranica	Geophyte
Asclepias stellifera	Geophyte
Asparagus larcinus	Shrub
Berkheya macrocephala	Herb
Bromus leptoclados	Grass
Conyza podocephala	Herb
Cymbopogon pospischillii	Grass
Cynodon dactylon	Grass
Cyperus longus	Sedge
Cyperus marginatus	Sedge
Eragrostis chloromelas	Grass
Eragrostis lehmanniana	Grass
Euphorbia clavaroides	Succulent
Euphorbia pseudotuberosa	Succulent

Galium capense	Herb
Haemanthus montanus	Geophyte
Haplocarpha scaposa	Herb
Hypoxis rigidula	Geophyte
Imperata cylindrica	Grass
Ipomoea oblonga	Creeper
Juncus exertus	Rush
Lepidium africanum	Herb
Paspalum distichum	Grass
Pentzia incana	Dwarf shrub
Persicaria lapathifolia	Herb
Phragmites australis	Reed
Ranunculus multifidus	Herb
Scabiosa columbaria	Herb
Searsia pyroides	Shrub
Setaria sphacelata	Grass
Sonchus oleraceus	Herb
Sporobolus africanus	Grass
Sporobolus fimbriatus	Grass
Themeda triandra	Grass
Typha capensis	Bulrush

Appendix C: Soil Samples Methodology

Obligate wetland vegetation was utilised to determine the presence and border of wetlands. Soil samples were used to confirm the wetland conditions in the study area. Soil samples were investigated for the presence of anaerobic evidence which characterises wetland soils.

Within wetlands the hydrological regime differs due to the topography and landscape. For instance; a valley bottom wetland would have a main channel that is below the water table and consequently permanently saturated, i.e. permanent zone of wetness. As you move away from the main channel the wetland would become dependent on flooding in order to be saturated. As a result along this hydrological regime areas of permanent saturation, seasonal and temporary saturation would occur. At some point along this gradient the saturation of the soil would be insufficient to develop reduced soil conditions and therefore will not be considered as wetland.

Within wetland soils the pores between soil particles are filled with water instead of atmosphere. As a result available oxygen is consumed by microbes and plantroots and due to the slow rate of oxygen diffusion oxygen is depleted and biological activity continues in anaerobic conditions and this causes the soil to become reduced.

Reduction of wetland soils is a result of bacteria decomposing organic material. As bacteria in saturated soils deplete the dissolved oxygen they start to produce organic chemicals that reduce metals. In oxidised soils the metals in the soil give it a red, brown, yellow or orange colour. When these soils are saturated and metals reduced the soil attains a grey matrix characteristic of wetland soils.

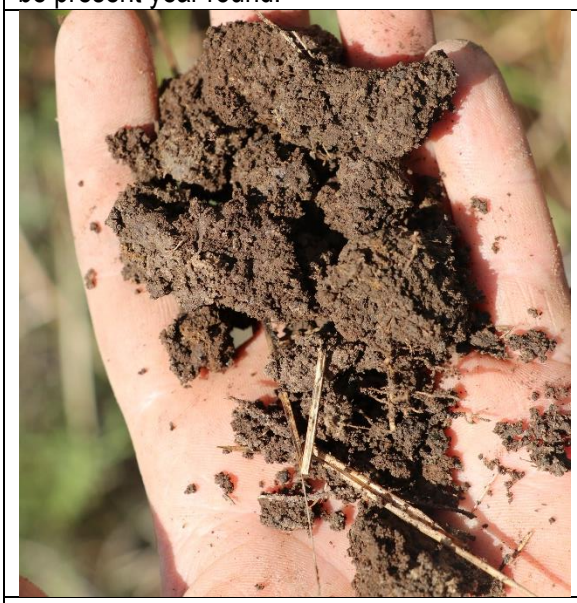
Within this reduction taking place in the wetland soils there may be reduced matrix, redox depletions and redox concentrations. The reduced matrix is characterised by a low chroma and therefore a grey soil matrix. Redox depletions result in the grey bodies within the soil where metals have been stripped out. Redox concentrations result in mottles within the grey matrix with variable shape and are recognised as blotches or spots, red and yellow in colour.

Soil wetness indicator is used as the primary indicator of wetlands. The colour of various soil components are often the most diagnostic indicator of hydromorphic soils. Colours of these components are strongly influenced by the frequency and duration of soil saturation. Generally, the higher the duration and frequency of saturation in a soil profile, the more prominent grey colours become in the soil matrix.

Coloured mottles, another feature of hydromorphic soils, are usually absent in permanently saturated soils and are at their most prominent in seasonally saturated soils, becoming less abundant in temporarily saturated soils until they disappear altogether in dry soils (Collins 2005).

The following soil wetness indicators can be used to determine the permanent, seasonal and temporary wetness zones. The boundary of the wetland is defined as the outer edge of the temporary zone of wetness and is characterised by a minimal grey matrix (<10%), few high chroma mottles and short periods of saturation (less than three months per year). The seasonal zone of wetness is characterised by a grey matrix (>10%), many low chroma mottles and significant periods of wetness (at least three months per year). The permanent zone of wetness is characterised by a prominent grey matrix, few to high chroma mottles, wetness all year round and sulphuric odour (rotten egg smell). According to convention hydromorphic soil must display signs of wetness within 50 cm of the soil surface (DWAF 2005).

Table 1: Soil samples taken along a lateral transect of the Sand River at the proposed abstraction site (S 28.243102°, E 27.655011°).

	
Soil sample taken in the marginal zone, at the water's edge of the main channel of the Sand River. Soils indicate a prominent grey matrix with feint mottling which is indicative of a permanent zone of wetness. Wetland conditions are considered to be present year round.	Soil sample taken along the lower portion of the lower zone of the riverbank. Soils contain a lower grey matrix (<10%) but with clear mottling which is indicative of a seasonal zone of wetness. Wetland conditions are present on a seasonal basis.
	
Soil sample taken along the upper portion of the lower zone of the riverbank where seepage was also evident. Soils contain a prominent grey matrix and clearly visible mottling and indicate a seasonal zone of wetness. Wetland conditions are present on a seasonal basis.	Soil sample taken in the upper zone of the riverbank. A grey matrix is not prominent (<10%) but with feint mottling still evident. This is indicative of a temporary zone of wetness. This also indicates the border of wetland conditions where saturated soils conditions will no longer be present.

	
Soil sample taken within the floodplain of the river. Soils still contain a significant clay content but without a discernible grey matrix of mottling and wetland conditions are therefore absent. The floodplain does however still form part of the riparian zone of the river.	Soil sample taken outside the floodplain in the adjacent terrestrial environment. Note soils have a more reddish, uniform colour with low clay content.

Appendix D: Index of Habitat Integrity (IHI) Summary

For the complete IHI please contact the author of this report.

ASSESSMENT UNIT INFORMATION	
ASSESSMENT UNIT INFORMATION	Cyferfontein Dam Abstraction Works
UPPER LATITUDE	
UPPER LONGITUDE	
UPPER ALTITUDE	
LOWER LATITUDE	
LOWER LONGITUDE	
LOWER ALTITUDE	
SURVEY SITE (if applicable)	Sand River
SITE LATITUDE (if applicable)	S 28.243102
SITE LONGITUDE (if applicable)	E 27.635011
SITE ALTITUDE (if applicable)	1436 m
WMA	Middle Vaal
QUATERNARY	C42B
ECOREGION 2	11_3
DATE	09/12/2022
RIVER	Sand River
TRIBUTARY	
PERENNIAL (Y/N)	**Y**
GEOMORPH ZONE	**FOOTHILL**
WIDTH (m)	**2-15**

METRIC GROUP	RATING	CONFIDENCE
HYDROLOGY MODIFICATION	2.1	2.0
PHYSICO-CHEMICAL MODIFICATION	1.4	3.0
BED MODIFICATION	1.5	4.0
BANK MODIFICATION	1.5	3.0
CONNECTIVITTY MODIFICATION	1.5	4.0
INSTREAM IHI%	67.2	
CATEGORY	C	
CONFIDENCE	3.2	

HABITAT INTEGRITY CATEGORY	DESCRIPTION	RATING (% OF TOTAL)
A	Unmodified, natural.	90-100
B	Largely natural with few modifications. A small change in natural habitats and biota may have taken place but the ecosystem functions are essentially unchanged.	80-89
C	Moderately modified. Loss and change of natural habitat and biota have occurred, but the basic ecosystem functions are still predominantly unchanged.	60-79
D	Largely modified. A large loss of natural habitat, biota and basic ecosystem functions has occurred.	40-59
E	Seriously modified. The loss of natural habitat, biota and basic ecosystem functions is extensive.	20-39
F	Critically / Extremely modified. Modifications have reached a critical level and the system has been modified completely with an almost complete loss of natural habitat and biota. In the worst instances the basic ecosystem functions have been destroyed and the changes are irreversible.	0-19

METRIC GROUP	RATING	CONFIDENCE
HYDROLOGY	2.13	3.00
BANK STRUCTURE MODIFICATION	1.79	4.00
CONNECTIVITY MODIFICATION	1.50	4.00
RIPARIAN HABITAT INTEGRITY (%)	63.26	
CATEGORY	C	
CONFIDENCE	3.67	

HABITAT INTEGRITY CATEGORY	DESCRIPTION	RATING (% OF TOTAL)
A	Unmodified, natural.	90-100
B	Largely natural with few modifications. A small change in natural habitats and biota may have taken place but the ecosystem functions are essentially unchanged.	80-89
C	Moderately modified. Loss and change of natural habitat and biota have occurred, but the basic ecosystem functions are still predominantly unchanged.	60-79
D	Largely modified. A large loss of natural habitat, biota and basic ecosystem functions has occurred.	40-59
E	Seriously modified. The loss of natural habitat, biota and basic ecosystem functions is extensive.	20-39
F	Critically / Extremely modified. Modifications have reached a critical level and the system has been modified completely with an almost complete loss of natural habitat and biota. In the worst instances the basic ecosystem functions have been destroyed and the changes are irreversible.	0-19

	MRU
INSTREAM IHI	
Base Flows	-2.0
Zero Flows	2.0
Floods	2.5
HYDROLOGY RATING	**2.1**
pH	1.5
Salts	1.0
Nutrients	1.5
Water Temperature	1.5
Water clarity	1.5
Oxygen	1.0
Toxics	1.5
PC RATING	**1.4**
Sediment	1.5
Benthic Growth	1.5
BED RATING	**1.5**
Marginal	1.5
Non-marginal	1.5
BANK RATING	**1.5**
Longitudinal Connectivity	1.5
Lateral Connectivity	1.5
CONNECTIVITY RATING	**1.5**
INSTREAM IHI %	**67.2**
INSTREAM IHI EC	**C**
INSTREAM CONFIDENCE	**3.2**

	MRU
RIPARIAN IHI	
Base Flows	-2.0
Zero Flows	2.0
Moderate Floods	2.0
Large Floods	2.5
HYDROLOGY RATING	**2.1**
Substrate Exposure (marginal)	1.0
Substrate Exposure (non-marginal)	2.0
Invasive Alien Vegetation (marginal)	1.0
Invasive Alien Vegetation (non-marginal)	3.0
Erosion (marginal)	1.0
Erosion (non-marginal)	1.0
Physico-Chemical (marginal)	1.0
Physico-Chemical (non-marginal)	1.5
Marginal	1.0
Non-marginal	3.0
BANK STRUCTURE RATING	**1.8**
Longitudinal Connectivity	1.5
Lateral Connectivity	1.5
CONNECTIVITY RATING	**1.5**
RIPARIAN IHI %	**63.3**
RIPARIAN IHI EC	**C**
RIPARIAN CONFIDENCE	**3.7**

Appendix E: Risk Assessment Matrix

RISK MATRIX (Based on DWS 2015 publication: Section 21 c and I water use Risk Assessment Protocol)

Risk to be scored for construction and operational phases of the project. MUST BE COMPLETED BY SACNASP REGISTERED PROFESSIONAL MEMBER REGISTERED IN AN APPROPRIATE FIELD OF EXPERTISE

					Severity															
No.	Phases	Activity	Aspect	Impact	Flow Regime	Physico & Chemical (Water Quality)	Habitat (Geomorph+Vegetation)	Biota	Severity	Spatial scale	Duration	Consequence	Frequency of activity	Frequency of impact	Legal Issues	Detection	Likelihood	Significance	Risk Rating	Confidence level	Control Measures
1	Mostly Construction but extending there after	Construction of new abstraction works in the Sand River, including construction of a coffer dam.	Excavation of sediment from the main channel.	Construction will remove riparian vegetation and disturb the riverbanks which will result in destabilisation of the riverbank and increase the sediment load. Increased establishment of exotic weeds and invaders due to disturbance caused by construction is also probable.	2	4	4	3	3.25	3	2	8.25	4	4	5	2	15	123.75	M	80	This impact will occur mainly during the construction phase but will only cease once the riverbank has been stabilised and adequate rehabilitation of the riverbank has been completed. Mitigation as stipulated within Section 4.4 should be implemented in order to reduce the anticipated impacts associated with the disturbance of the riverbank.
	Mostly Operational Phase		Construction of a coffer dam and continuous dewatering of construction area.	The initial construction of the coffer dam will result in substantial impacts, especially in terms of sediment release and disturbance of the riverbed. Continuous dewatering of the coffer dam will in itself also result in substantial impacts (sediment release, contamination by construction materials).	1	4	4	3	3	3	2	8	4	4	5	2	15	120	M	80	This impact will also largely be confined to the construction phase but will only cease once the coffer dam has successfully been removed and rehabilitated. Adequate mitigation should include the implementation of attenuation areas.
	Mostly Operational Phase		Construction of an access road and construction laydown area.	Construction of an access road construction laydown area along the floodplain will also cause disturbance although on a local scale. These areas will require the removal of riparian vegetation. Increased erosion, sediment load and exotic weed establishment is also likely.	1	2	2	2	1.75	1	2	4.75	2	2	5	1	10	47.5	L	80	The impact will be largely confined to the construction phase as long as the access road and laydown area is rehabilitated afterwards. This is likely reversible impact and therefore has a low risk. It is still important that adequate rehabilitation and monitoring takes place. Mitigation as stipulated within Section 4.4 should be implemented in order to reduce the anticipated impacts associated with the abstraction works.

APPENDIX D_3

Preliminary Design Report

aurecon

Senekal Bulk Water Supply

Sand River and Cyferfontein Off-Channel Storage Dam Abstraction Works and Booster Pump Station– Detail Design Report

Reference: 111826

Prepared for: Setsoto Local Municipality

Revision: 00

9 June 2020

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Current Revision	**00**					

Approval			
Author signature		Approver signature	
Name	**C West**	Name	**EP Horn**
Title	**Engineer**	Title	**Pr Tech Eng**

Senekal Bulk Water Supply

Sand River and Cyferfontein Off-Channel Storage Dam Abstraction Works and Booster Pump Station– Detail Design Report

Date 9 June 2020
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Contents

Appendices

Appendix A

Water Demand Calculations

Appendix B

Pump Station System Curves

Appendix C

Reinforced Concrete Pump Station and Vault Doors

Appendix D

Proposed Anti-Theft Kiosk Photo's and Typical Detail Drawing

Figures

1 Introduction

1.1 Background

The Senekal Bulk Water Supply Scheme seeks to improve the treated drinking water supply to the town of Senekal/Matwabeng, situated in the Setsoto Local Municipality.

Raw water will be abstracted from the two existing sources namely the Sand River, to the north of Senekal/Matwabeng, and the Sand Spruit, to the south of Senekal/Matwabeng. From the Sand River and Sand Spruit abstraction pump stations, the raw water will be transported to the Cyferfontein and De Put off-channel storage dams respectively. From the Cyferfontein and De Put off-channel storage dams the raw water will be transported via a new raw water booster pump stations and rising main pipelines to the new centralised water treatment works in Senekal.

The option of pumping surplus raw water from the Cyferfontein off-channel storage dam to the De Put off-channel storage dam will also be possible by the implementation of a bi-directional pipeline. The surplus raw water from the Cyferfontein off-channel storage dam will be diverted into either the water treatment works inlet or the bi-directional pipeline by the implementation of a bi-directional take-off valve chamber. This valve chamber will be situated at the water treatment works inlet. The above-mentioned option will allow for additional storage capacity in the De-Put off-channel storage dam should the need arise.

From the water treatment works clear water will be stored in the existing 2 x 2.5 Mℓ, 1 x 5 Mℓ and new 11 Mℓ clear water storage reservoirs. The total storage capacity of the above-mentioned reservoir will allow for the required minimum 48 hours storage capacity. From the clear water storage reservoirs, clear water will be distributed to the town of Senekal/Matwabeng.

It was agreed that both the Sand River and Sand Spruit sources should be able to supply the full average daily demand of 15 515 Kℓ/day (Including all losses). This is to allow for the full average daily demand to be supplied from both sources should one of the sources be out of operation. This should however only be implemented over short periods of time as the annual yield does not allow for the long term full average annual demand supply from the sources respectively. Please refer to the water demand calculations attached under **Appendix A**.

To ensure adequate maintenance time of the pumping equipment, it was assumed that pumps should not operate more than 20 hours per day. The full average daily demand to be abstracted from each of the sources can be calculated as 180 ℓ/s over a 20-hour operational day.

This Detail Design Report will focus on the Sand River abstraction and Cyferfontein off-channel storage dam abstraction and the Cyferfontein booster pump station.

1.2 Project Locality

The project is located in Senekal/Matwabeng within the Free State province and falls within the boundaries of the Setsoto Local Municipality.

Figure 1, below, indicates the project's locality, Cyferfontein off-channel storage dam, De Put off-channel storage dam

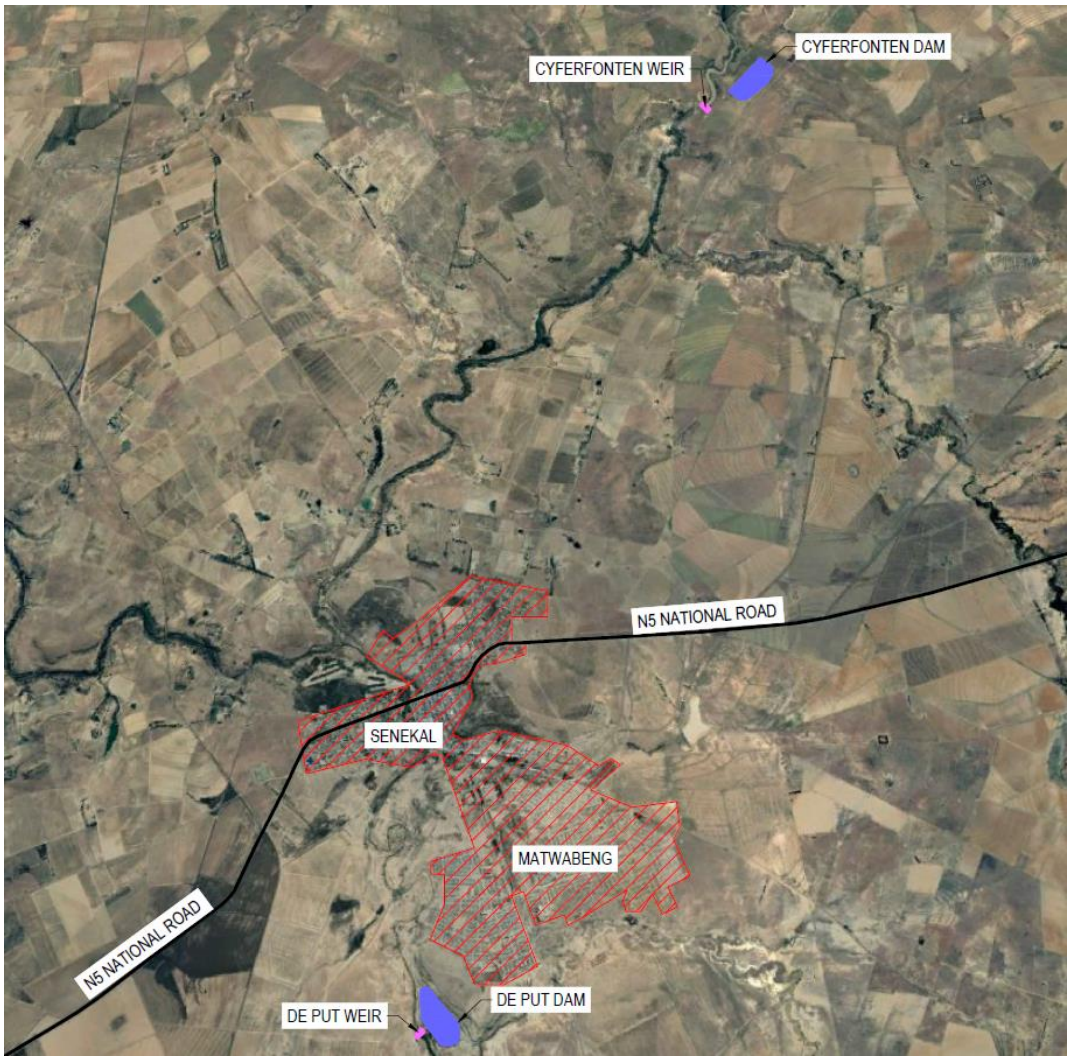


Figure 1 Locality of Project

1.3 Purpose of the Report

The purpose of this report is to document the client's requirements, design assumptions and the detail design process of abstracting water from the Sand River and transporting it to the new centralised water treatment works.

Section 2 provides a description of the scope of works and the demand calculations

Section 3 discusses the information used for design: raw water data, existing or reference records, survey information and geotechnical information.

Section 4 discusses all the civil aspects of the detail design of the river abstraction, dam abstraction and the booster pump station. All civil work (structural, pipework, pumps etc) will be covered in this section.

Section 5 discusses permission and regulatory requirements.

Section 6 discusses the controls and instrumentation required.

Section 7 discusses al the electrical aspects of the detail design including control and instrumentation, bulk (main) power and small power supply.

Section 8 discusses all structural aspects of the detail design including design overview, applicable standards and requirements, specifications, design loads and materials

Section 9 will take an in depth look at the security concerns faced and measures to counter these concerns.

Section 10 will provide conclusions and recommendations.

2 Scope of Works

2.1 Overall Scope of Works

The overall scope of the project comprises of 3 stages, in order they are:

1. Raw water will be abstracted from the Sand River and transported to the existing 1.5 million m^3 Cyferfontein storage dam via a rising main and concrete channel.
2. The raw water will be abstracted from the Cyferfontein storage dam and transported to a booster pump station via a 400mm steel pipe section and HDPE pipe section.
3. The raw water will be transported via the booster pump station to the new centralised water treatment works.

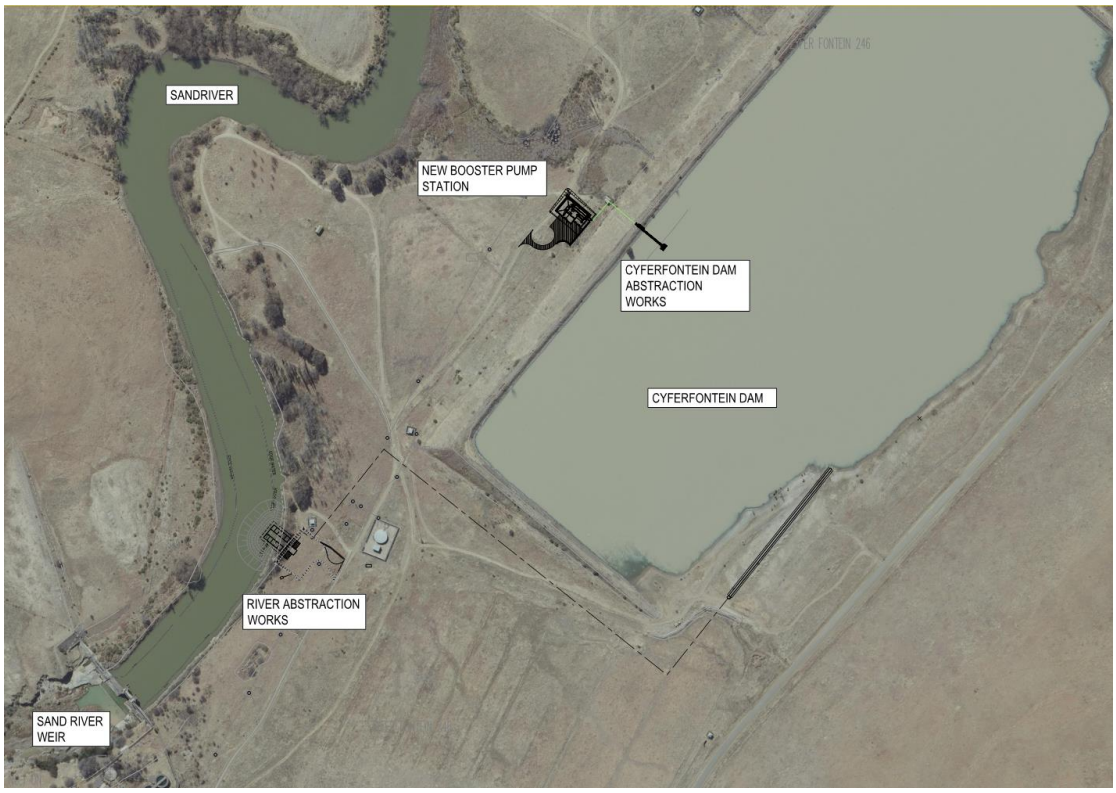


Figure 2 Cyferfontein Abstraction Works

2.2 Water Demand Calculations

An investigation using figures provided by the Department of Water and Sanitation revealed that, after losses, a demand of 180l/s would be required for the town of Senekal. This is discussed in depth in the Water Treatment Works Concept Design Report issued to Setsoto Local Municipality during May 2019. As mentioned before this demand is to be supplied by two (2) sources, The Sand River and the Sand Spruit. These sources should be able to supply the full demand independently as this would ensure that the full demand will be met should one of the sources be out of operation.

The demand calculations can be seen in Appendix A.

3 Base Data

3.1 Water Quality

The water quality of the two (2) water sources as well as required/proposed treatment is discussed in-depth in the Water Treatment Works Concept Design Report. The quality of the water itself of the Sand River was not used as a consideration or influential factor in the design of the abstraction process, however potential debris was a consideration in the design of the river abstraction.

3.2 Survey Information

A topographical survey received February 2019 was used

3.3 Site Geology

A geotechnical report was compiled in July 2019 and investigated 3 study areas namely:

- the water treatment works just outside of Senekal,
- De Put off-channel storage dam and the
- Cyferfontein off-channel storage dam.

This report focused and advised on 5 aspects of the study areas:

- Site Geology
- Site Geohydrology
- Founding Conditions
- Excavation Conditions
- Material Utilization Potential

For the Cyferfontein abstraction works 3 rotary core boreholes were drilled, numbered 28, 29 and 30. Borehole 28 was drilled to the immediate north-west of the Cyferfontein storage dam, borehole 29 was drilled as close as possible to the edge of the Sand River and borehole 30 was drilled approximately 25m away from the water's edge higher up a relatively steep riverbank.

Detailed results can be seen in Appendix X. During construction of both the river abstraction as well as the booster pump station, provision should be made for the dewatering of the excavated areas. The investigation recommended that all both new pump stations at the Cyferfontein storage dam be founded on/within a soft rock or harder material. Conventional spread footings would be preferable at an

allowable bearing capacity which does not exceed 300kPa. The structures of these new pump stations should be anchored to the bedrock as a result of the buoyancy effect of the groundwater.

4 Detail Design

4.1 Sand River Abstraction

4.1.1 Design Overview

The purpose of the Sand River abstraction pump station is to abstract raw water from the Sand River and transfer it to the Cyferfontein off-channel storage dam. The duty point for the raw water abstraction pump station was calculated as 108 (60% of total daily demand) to 180ℓ/s (100% of total daily demand) @ +- 26.555m.

After the elimination of the unfeasible concepts, it was decided that the abstraction works be constructed so that the intake is set back from the river's edge with a short connecting channel. The channel will act as a trap to larger debris. The inlet of the structure would be covered with a grid in order to prevent the larger material entering and possibly damaging the raw water pumps. Any objects able to enter through the grid would be considered when specifying the required pumps. Advantages of this type of construction would be:

- A large variation in water levels could be accommodated
- Convenient access to the installation (as opposed to installation situated in the river itself)
- Installation can be accessed during flood events. Except during the most severe floods
- Installation would not severely impact any river traffic

The abstraction pump station would be located on the outside of the bend closest to the dam wall. Locating the abstraction on the outside of the channel as this would minimise the amount of sediments and debris that would collect in the gabion channel leading up to the pump station. This is also conveniently situated as the Cyferfontein storage dam is located on the same side of the river and would negate the need for a pump line to cross the river. Access to the abstraction pump station from the existing gravel road is provided by a ramp and G6 compacted platform (see Figure 3 below)

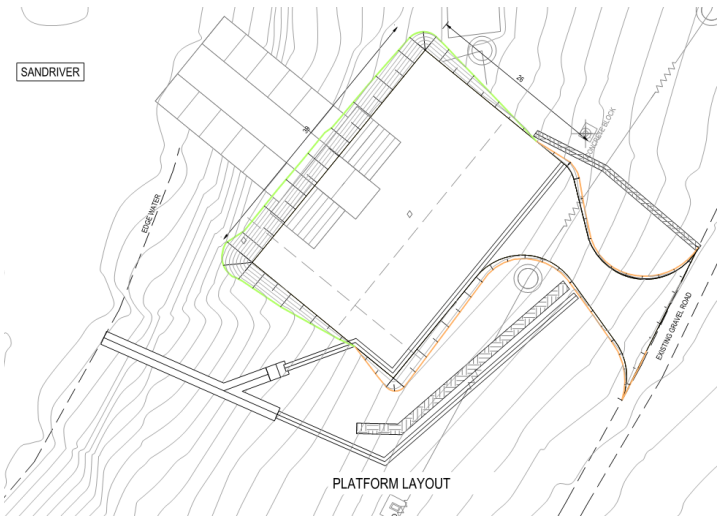


Figure 3 Sand River Abstraction Access Platform

The raw water enters the structure where the pumps are housed from the gabion channel and through the inlet screen. The pump station structure houses 2 submersible pumps (duty/standby), each capable of supplying the full demand for the new centralised water treatment works in Senekal. The 400mm mild steel pipe work for each pump accommodates a non-return valve as well as a rising spindle gate valve. These valves are positioned above the fibreglass moulded grating platform. The top of the platform sits 6.743m above the chamber floor level and 1.95m above the top of weir level. This was designed as such to accommodate any flooding that may occur. As a result, the valves would almost never be submerged, prolonging their lifespan but also ensuring ease of access should any maintenance or inspections be required. The 2 pipes join with a sweeping T run out the pump station and back under ground and expanding to a 400mm PVC-O pipe.

From the abstraction pump station, raw water would be transported via a 450mm PVC-O pipe (578m, one scour and one air valve) and discharging over an energy dissipater. The raw water then runs in a 3m trapezoidal gabion channel to a 135m trapezoidal shaped earth channel and then finally over a 20m trapezoidal gabion channel before running into the raw water storage dam.

A coffer dam would first be constructed to allow for construction to take place (Figure 3). This would allow the construction area to remain dry during construction. Although some form of water extraction would be required to remove ground water.

Designs for the abstraction pump station as well as coffer dam can be seen in Figures 4, 5, 6 and 7. The tender drawings of the aspects discussed can be seen in Appendix C

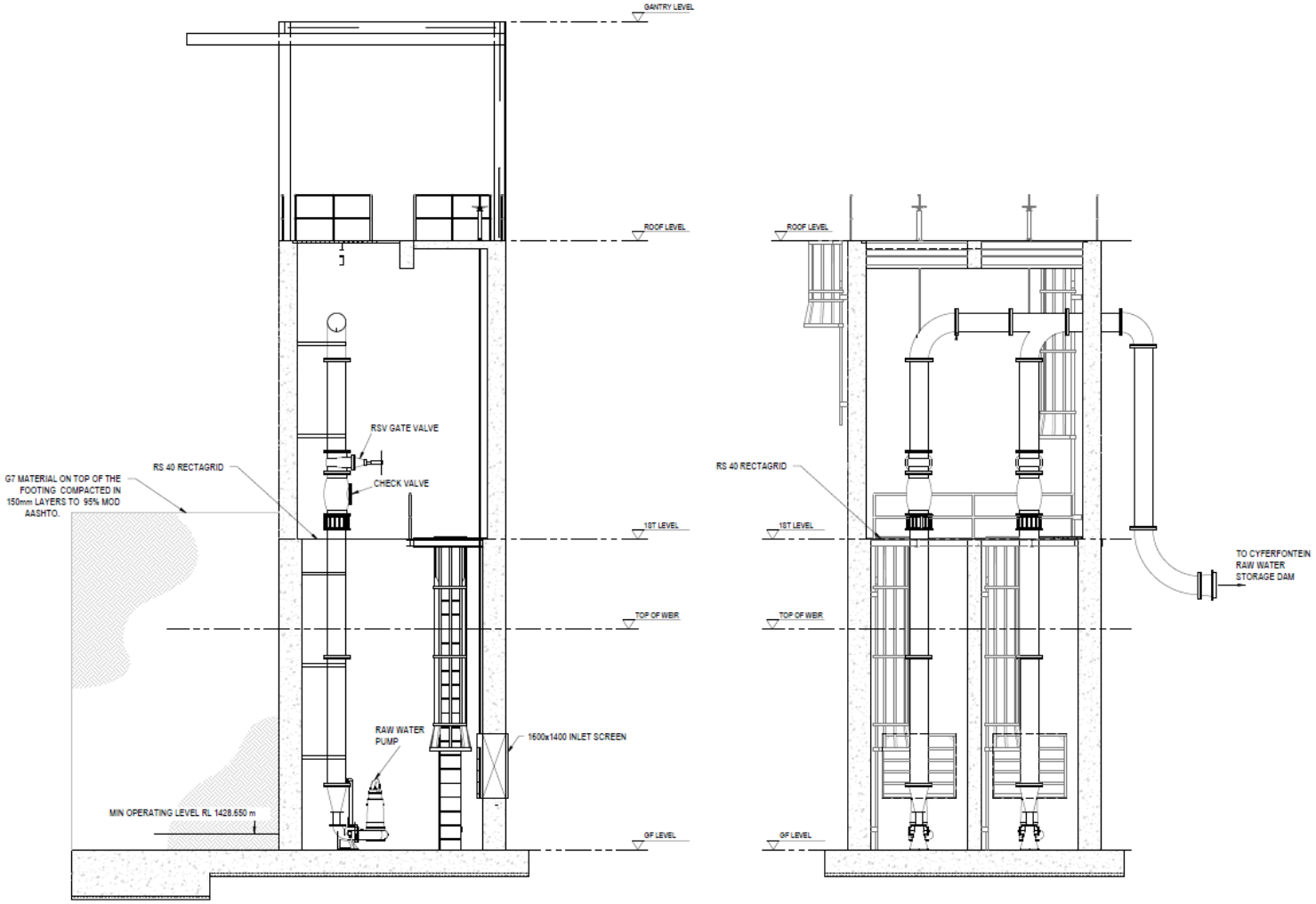


Figure 4 Front and Side View River Abstraction Pump Station

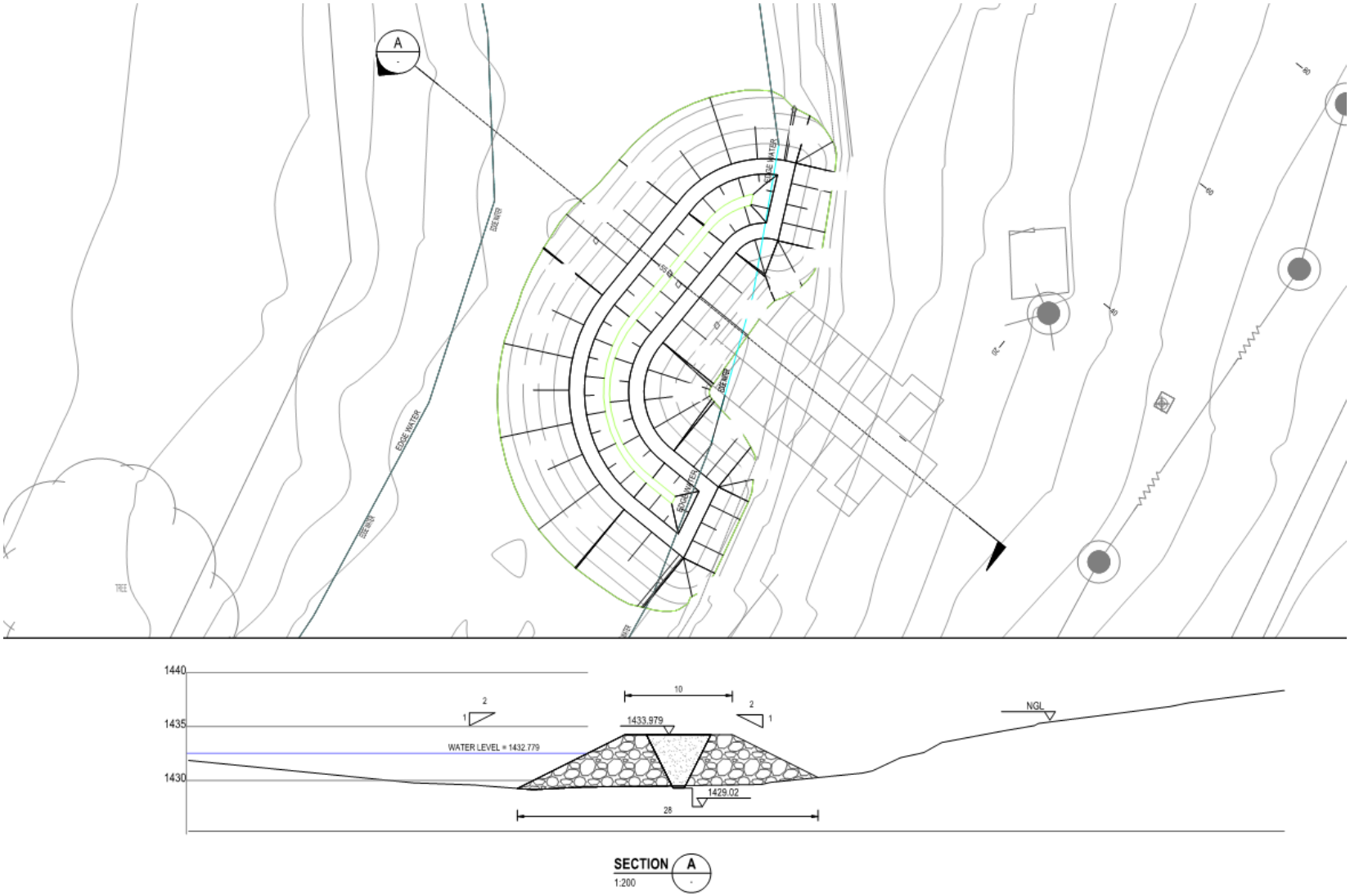


Figure 5 Coffer Dam Layout and Sections

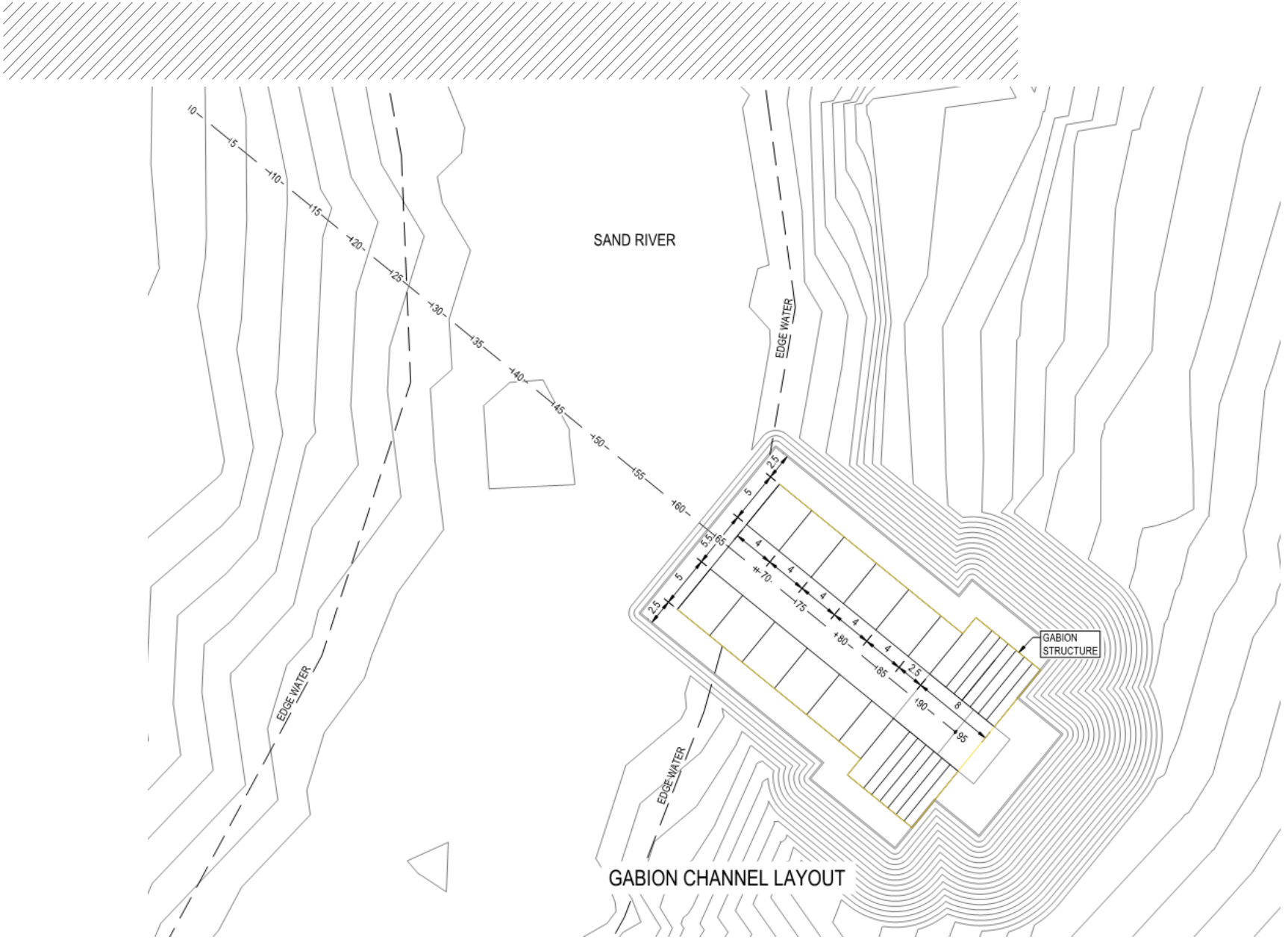


Figure 6 Plan View River Abstration Channel Pump Stationt

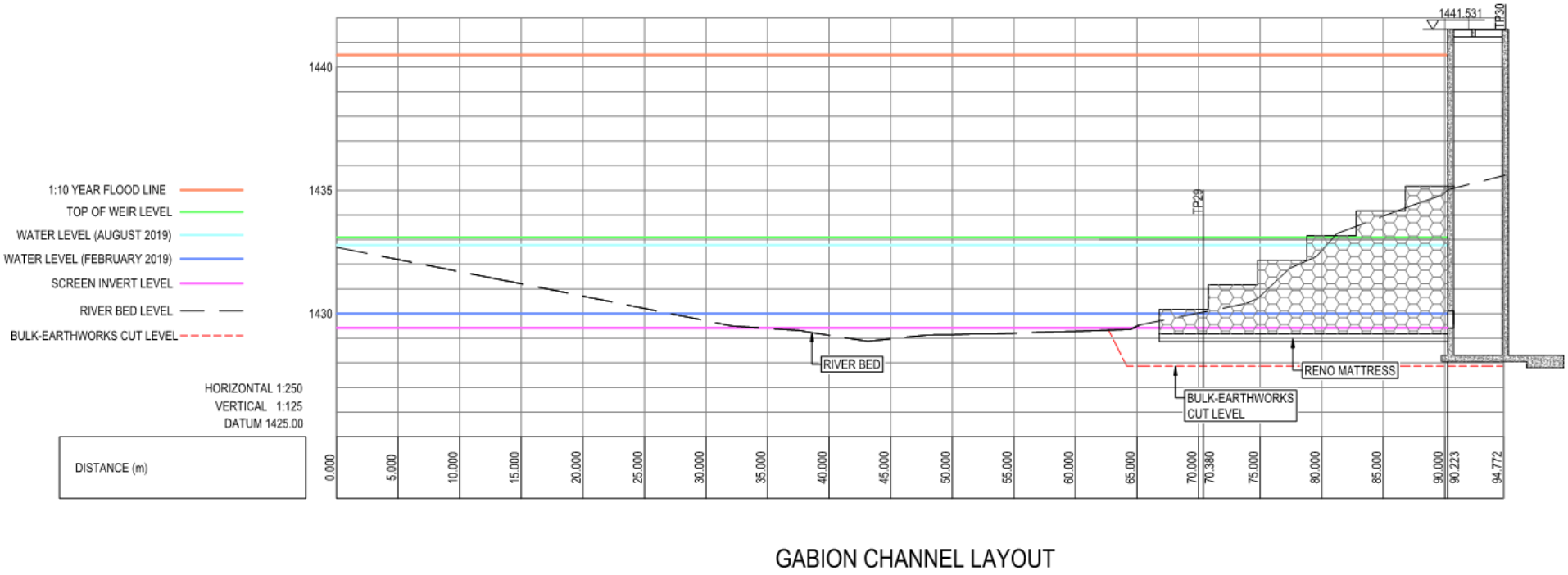


Figure 7 Sectional View of River Abstraction Pump Station

4.1.2 Summary of Sand River Abstraction and Transport Design:

1. Raw water flows through short gabion channel to the abstraction pump station (example seen in Figure 8 below)
2. The water enters the structure through two (2) inlet screens.
3. Submersible raw water pumps pump water approximately 575m into a 155m gabion/earth channel where from the water will gravitate into the Cyferfontein off-channel storage dam.
4. Duty point will be 108 l/s to 180 l/s at 26.555m (static head = 22.12m). This will depend on the output of the Sand Spruit abstraction works.
5. Duty/standby setup with both the duty and standby pumps being able to supply 60% of the total daily demand each (108 l/s). For 100% of the total daily demand the duty and standby will operate simultaneously to achieve 180 l/s. This means the variable speed drive will take each pump's delivery down to achieve 180 l/s.
6. Pumps to be variable speed drive with soft starters, capable of handling solids of up to 40mm
7. Discharge pipeline is proposed as DN400mm, class 12.5 PVC-O pipe. Erosion protection as well as energy breakers to be incorporated at point of discharge into the trapezoidal gabion channel.
8. Areas where access is required will be enclosed with heavy duty pre-cast concrete slabs.
9. There will be no visible equipment.
10. New and improved electrical security fence; possibly with beams, pepper spray etc will be implemented to protect against theft and vandalism.
11. All telemetry and communication to the main SCADA to be incorporated, this will allow for automatic stop/start, level control, flow control etc.

Figure 8 Example of a gabion channel (Vaal River abstraction, Aurecon project)

4.1.3 Key Constraints

The following factors were key constraints and considerations for the abstraction pump station's location and design:

1) Appropriate river flow dynamics (e.g. a good location along river) for sustainable long-term raw water abstraction.
    - Pump Station was located just upstream of weir to assure water would be at its deepest. The take-off channel was also located on the outside bend to ensure minimal sediment and debris which could possibly collect at the abstraction location.
2) Expected low water levels in the Sand River (drought periods).
    - The abstraction facility will be located deep enough to ensure that abstraction can still take place during unusually low flow (drought) periods.
3) Expected flood levels and durations for the Sand River.
    - The abstraction pump station facilities will need to be protected from certain flood events. To minimise the effect of a potential flood, valves that might require maintenance or are not best suited for being submerged for extended periods of time are all positioned close to 2m above the Sand River weir level.
4) Anticipated sediment and debris carried or entrained in the river water.
    - The position of the abstraction on the outer bend as well the construction of the gabion channel leading up to the abstraction pump station will minimise the potential effect of any large amounts of sediment and debris.
5) Accessibility of the facilities for operation and maintenance purposes, especially during certain river flood events.
    - The access platform will be constructed at a level sufficiently high enough to accommodate most flood scenarios. This will allow access to the facility in most flood situations.
6) Theft and Vandalism
    - The facilities will be protected against theft and vandalism and access to expensive equipment should be limited to facilitate this. The location of the abstraction works is also remote enough to be considered low risk of vandalism and theft.

4.1.4 Summary

Based on all considerations it was decided that the off-channel river abstraction design along with the rising main into channel leading to the Cyferfontein raw water storage dam was the most efficient design.

4.2 Cyferfontein Off Channel Storage Dam Extraction

4.2.1 Design Overview

The objective of the Cyferfontein off channel storage dam abstraction is to transport the raw water from the dam, over the dam embankment to the new booster pump station. The duty point for the raw water abstraction pump station was calculated as 108 (60% of total daily demand) to 180 ℓ/s (100% of total daily demand) @ +- 26.555m, as it was with the Sand River abstraction.

Figure 9 Cyferfontein Abstraction Location

A few considerations for the location (Figure 9) and design of the Cyferfontein storage dam were discussed in the preliminary design report. It was decided that the existing structure located in the Cyferfontein storage dam would be used in some capacity to support both the submersible pumps as well as the pipe work transporting the water out of the dam and to the booster pump station. While the existing housing structure would be utilised as is, the existing platform would be rebuilt in order to accommodate and support the pipe work running from the pumps and over the dam wall. The abstraction structure is situated far enough from the gabion trapezoidal channel to allow most fine sediment from the river to settle down before it reaches the pumps

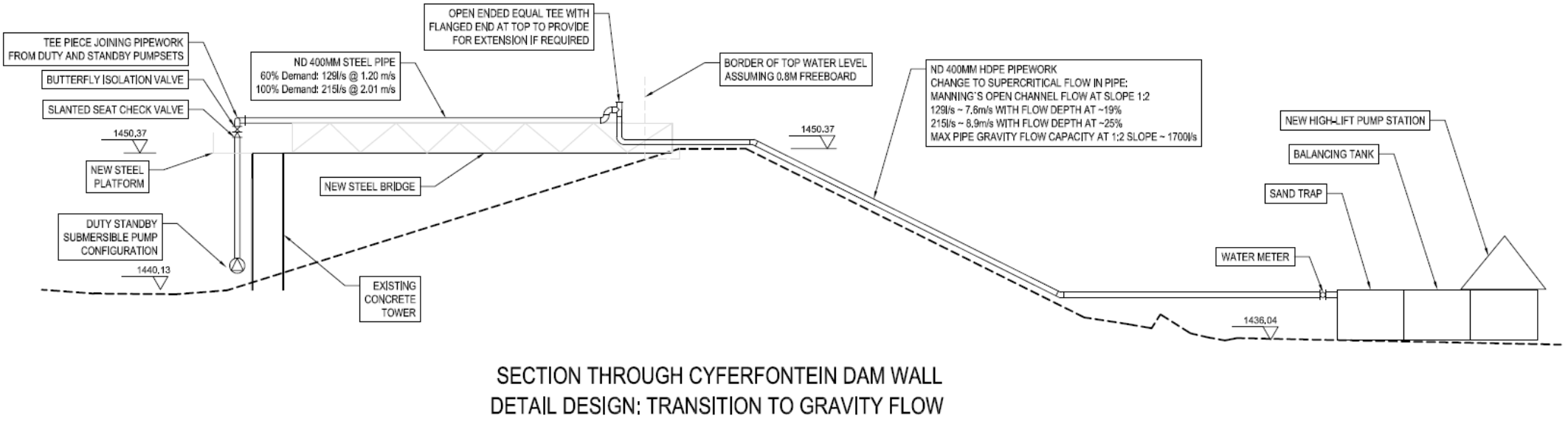
The new platform bridge would rest on the existing concrete structure in the Cyferfontein raw water storage dam and a 3m x 2m 750mm thick concrete slab on the crest of the dam wall. This bridge

would consist of 2 levels of Fibregrate moulded platforms. These platforms will span the length of the bridge. The lower platform would accommodate and support the pipe work from the abstraction pumps. The upper platform would allow access to the pipework, pumps and valves for installation/maintenance purposes. Two standard 15kg rail sections will run the length of the bridge and will allow for a permanent trolley on the bridge to transport the pumps, valves and pipes over the length of the bridge. The bridge will span just over 32m and will be constructed and joined in 9m segments. The upper platform will expand into a 3m x 5,6m platform over the concrete structure. This expanded platform will have two (2) openings on either side of the structure to allow for the lowering of the pipe work and pumps from the gantry beam which will run across the length of the platform and will be positioned just over 2m above the platform.

The submersible pumps (duty/standby) will be fixed to the bottom of the concrete structure, one on each side. As mentioned in the Concept Design Report the pumps required to meet the demand would be too large to be situated within the existing structure. The water will be pumped in 400mm dia. mild steel pipes running up the concrete structure. The contractor will be expected to provide a method statement before construction commences on how they will intend to construct and fix the pumps, pipes and valves to the structure. This will have to be approved by the engineer. The two pumping lines will meet up and join on the lower platform. The rising main steel pipe will be then run approximately 30m before it reaches a break-pressure point. This break-pressure design consists of an open-ended T into which the water will be pumped, from this point the raw water will gravitate over the dam wall and into the new booster pump station. A 1m length of steel pipe will be fixed to the open end of the T to prevent the pressurised raw water from flowing out at this point. Below the open T, a 6m wide, 200mm thick rip rap layer will be constructed in order to mitigate any erosion on the dam wall that could occur in the unlikely event that water does overflow from the open T-piece.

After the break-pressure, the mild steel pipe will run for about 3.9m before changing to a continuously welded 400mm HDPE pipe. This will prevent any potential leaks occurring at joints. This is in line with the dam safety regulations as any form of leaking water over an earth dam wall could cause erosion. The 60m HDPE gravity line will then discharge into the new booster pump station.

Figure 10 illustrates the design principle of the storage dam abstraction. Figure 11 shows a 3d rendering of the abstraction tower and pipework



SECTION THROUGH CYFERFONTEIN DAM WALL
DETAIL DESIGN: TRANSITION TO GRAVITY FLOW

Figure 10 Illustrated design for the Cyferfontein Storage Dam Abstration

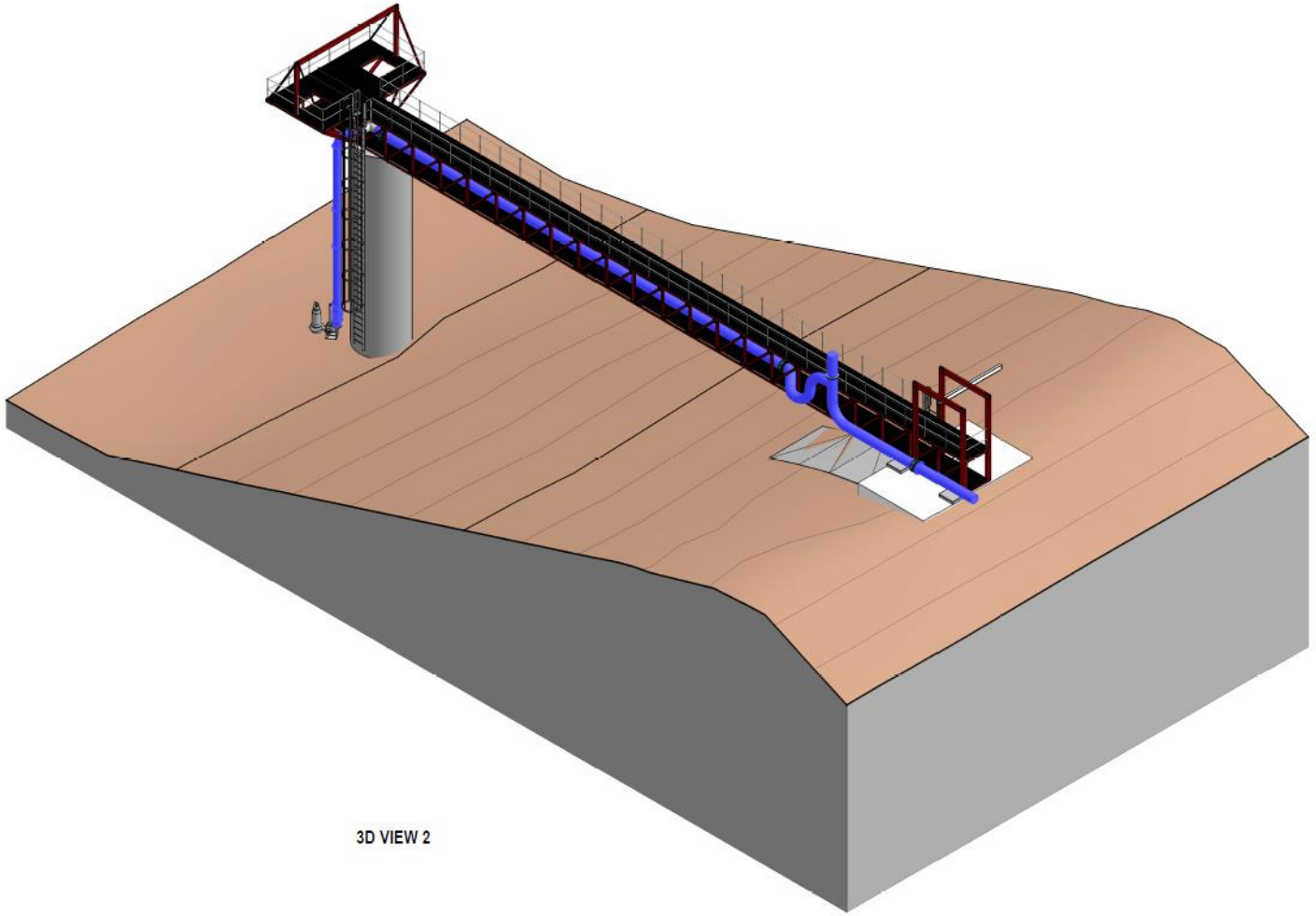


Figure 11 Isometric View of Cyferfontein Storage Dam Abstraction

4.2.2 Summary of Cyferfontein Storage Dam Abstraction Pump Station Design:

1. Raw water abstracted directly from Cyferfontein off-channel storage dam.
2. Submersible raw water pumps will pump raw water approximately 40m after which it will gravitate a further 58m to the new booster pump station.
3. Duty point will be 108 l/s to 180 l/s at 16m (static head = +-12m).
4. Duty/standby setup with both the duty and standby pumps to be able to supply 60% of the total daily demand each (108 l/s). For 100% of the total daily demand the duty and standby will operate simultaneously to achieve 180 l/s. This means the variable speed drive will take each pump's delivery down.
5. Pumps to be variable speed drive with soft starters, capable of handling solids of up to 40mm
6. Discharge pipeline is proposed as DN400mm, mild steel pipe up until the open-ended tee. From the open-ended tee, the pipe will be continuously welded HDPE.
7. The new steel bridge upper platform will provide access to the pumps, while the lower platform will provide support to the pipework.
8. Pipework will be visible, but pumps will always remain submerged.
9. New and improved electrical security fence; possibly with beams, pepper spray etc. will be installed.
10. All telemetry and communication to the main SCADA to be incorporated, this will allow for automatic stop/start, level control, flow control etc.

4.2.3 Key Constraints

The location and design of the facilities for the Cyferfontein storage dam abstraction facilities were constrained by the following key factors:

1) Pumps will need to be fully submerged in order to yield efficiently and effectively.
    - Pumps must be located on structure situated approximately 30m off the dam wall.
2) Expected low water levels during (drought periods).
    - The Cyferfontein Storage Dam has a significant capacity and will be able to supply the demand for quite some time before the water levels subside. The abstraction pumps will be located deep enough to ensure that abstraction can still take place during unusually low flow (drought) periods.
3) No construction permitted on or near the storage dam wall.
    - Significant construction on or around the dam is not permitted by DWS (dam safety regulations). Therefor any pipework running over the dam wall will be constructed on plinths for support.

4) Anticipated sediment pumped in from Sand River.
    - The discharge from the Sand river abstraction is located far enough from the off-channel dam abstraction point in order to allow the majority of sediment to settle before reaching the abstraction pumps.
5) Speed of raw water in gravity line.
    - Pipe material should be able to accommodate possible sediment flowing at high velocity without incurring significant damage. HDPE pipe will therefore be used.
6) Accessibility of the facilities for operation and maintenance purposes.
    - The facilities should still be operable and maintainable during certain low/high-level flood events. Traffic is allowed on the dam wall and will provide access to the facility.
7) Theft and Vandalism
    - The facilities should be protected against theft and vandalism and access to equipment should be limited to facilitate this. The location of the abstraction works is also remote enough to be considered low risk of vandalism and theft.

4.2.4 Summary

Based on all considerations considered, it was decided that utilising the existing structure to support the new pumps which would pump the water just over the dam wall after which it would gravitate to the new Cyferfontein booster pump station was the most practical solution. Any pipework running over the dam wall will have to be a continuous section in order to mitigate any chance of water leaking onto the dam wall. Pipe material chosen is designed to accommodate any settlement in the water flowing at a high velocity.

4.3 Cyferfontein Booster Pump Station

4.3.1 Project Overview

The objective of the Cyferfontein raw water booster pump station is to pump the raw from the Cyferfontein off-channel storage dam and transport it to the new centralised water treatment works (WTW). The duty point for the raw water booster pumps was calculated as 108 ℓ/s (60% of total daily demand) @ 81.4m to 180 ℓ/s (100% of total daily demand) @ 128.4m, as it was with the Sand River abstraction.

Figure 12 Location of New Booster Pump Station

As discussed in the Concept Report it was decided that the location of new booster pump station would be situated approximately 60m south west of the existing building. Locality indicated in Figure 12.

Raw water will be pumped and then gravitate to the Cyferfontein booster pump station (Section 4.2). The gravity line will split into two entrance points where the raw water will first pass through a sand trap before entering the pump station raw water sump, from here it will be abstracted and transported via the new Cyferfontein rising main to the new centralised water treatment works. The sand trap is designed to allow any sediment to settle. The sediment that settles will collect at the downstream end of the sand trap where it will enter the sludge discharge channel once enough sediment has collected. The raw water now separated from the sediment will then be stored in the raw water sump

before being pumped. The raw water sump can be able to be scoured if required. Plan, sections and 3D renderings of the proposed pump station can be seen in Figures 13 – 16 below.

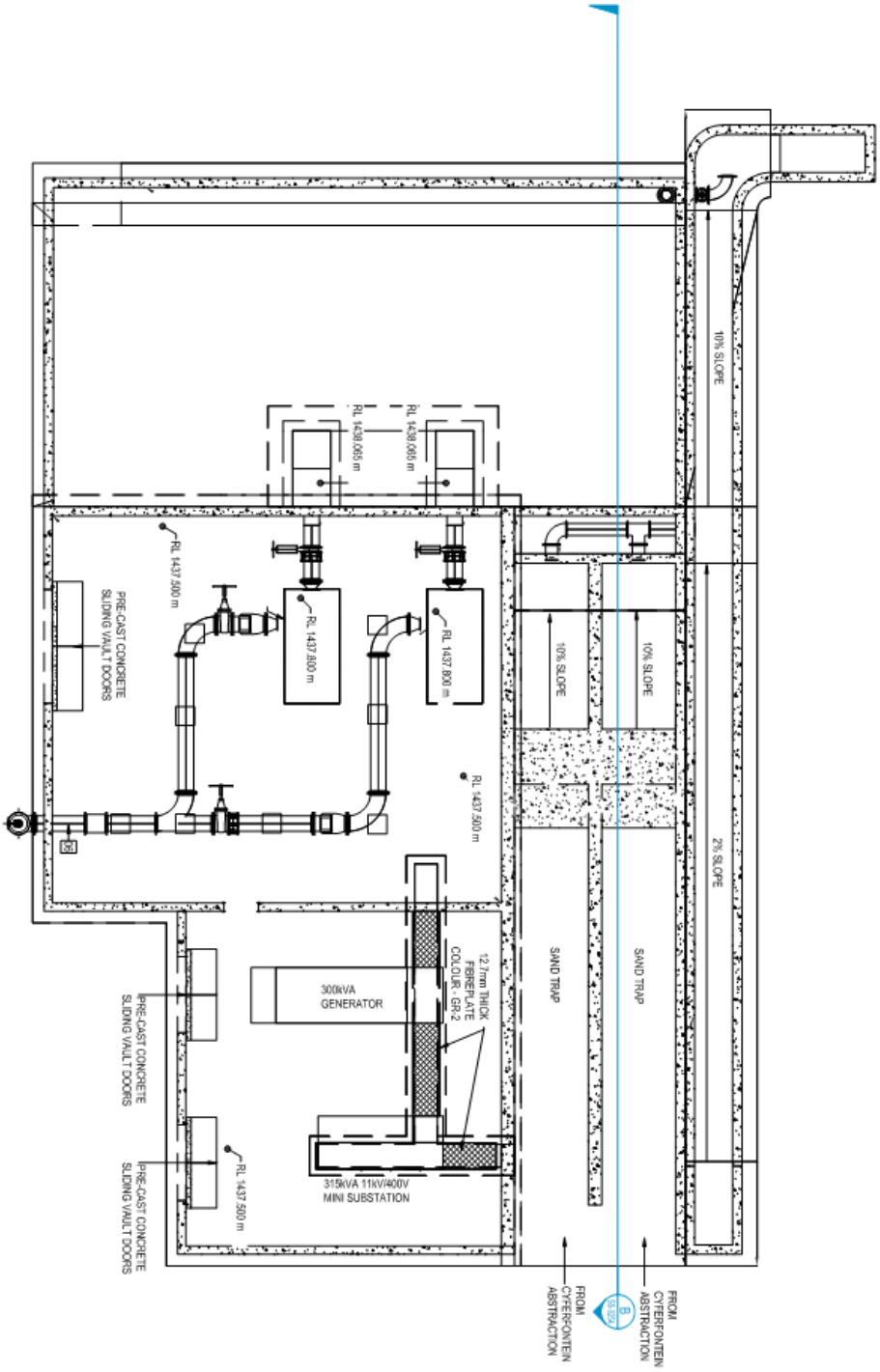


Figure 13 Plan View of Booster Pump Station Design

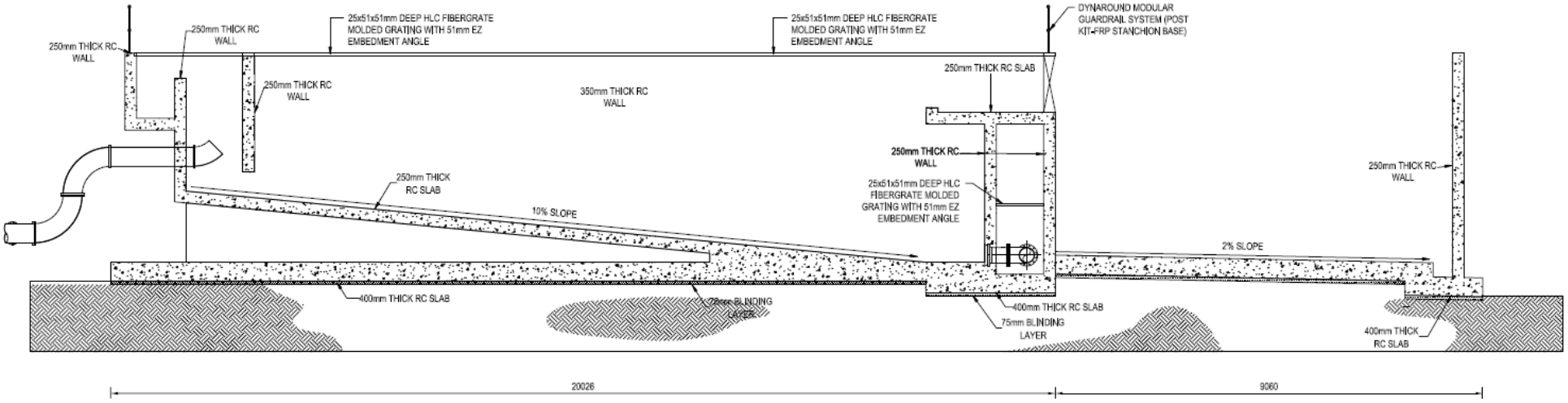


Figure 14 Section View of Booster Pump Station Design

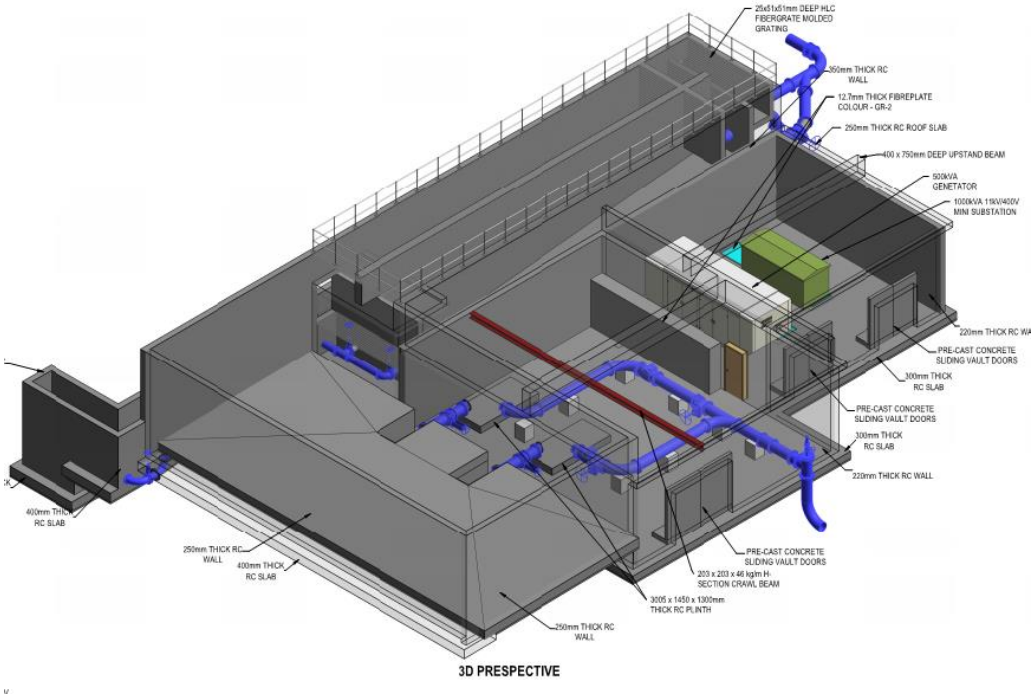


Figure 15 3D Perspective View of Booster Pump Station Design

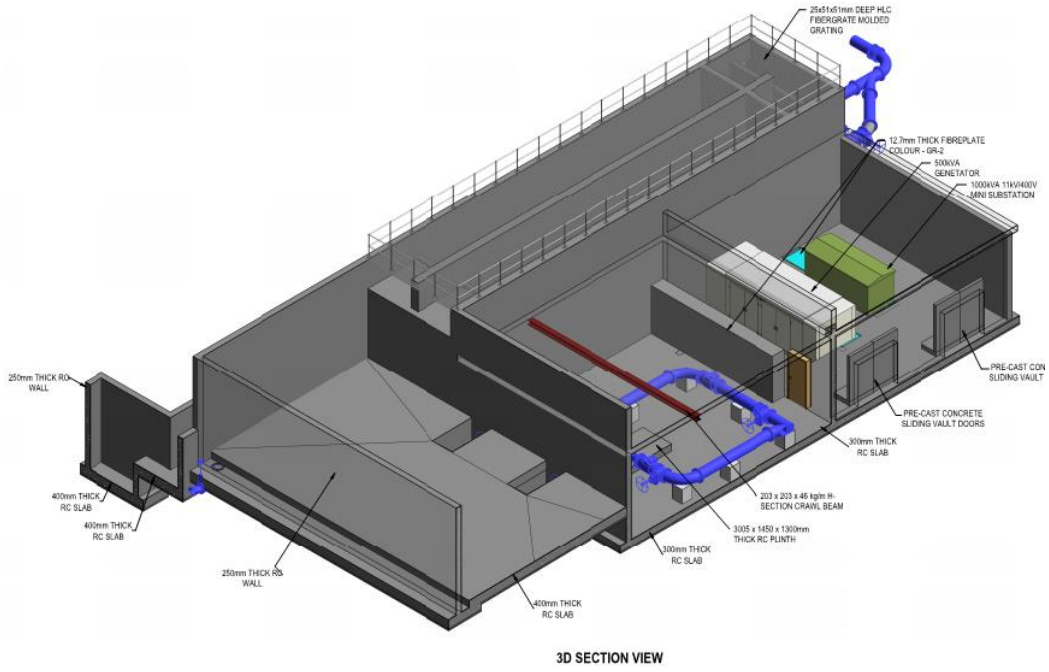


Figure 16 3d Section View of Booster Pump Station Design

4.3.2 Description of Proposed Cyferfontein Booster Pump Station:

1. Water is pump over the Cyferfontein off channel storage dam wall by the Cyferfontein storage dam abstraction pump station and then gravitates to the booster pump station via the newly constructed 400mm dia. HDPE pipe.

2. Gravity line splits into two. Each line flows into a separate sand trap channel.
3. Settlement occurs and the water and sediment are separated. Water flows into pump station sump / balancing tank. From here the booster pumps abstract the water and transport it to the new centralised water treatment works in Senekal (+- 11070.00m away).
4. Duty point will be 108 l/s and 180 l/s at 87.4m and 128.4m respectively. (static head = +- 62.04m).
5. Duty/standby setup with both the duty and standby pumps to be able to supply 60% of the total daily demand each (108 l/s). For 100% of the total daily demand the duty and standby will operate simultaneously to achieve 180 l/s. This means the variable speed drive will take each pump's delivery down to achieve the 180 l/s.
6. Pumps to be variable speed drive with soft starters, capable of handling solids of up to 40mm
7. Discharge pipeline is proposed as DN400mm, PVC-O Class 16.
8. New and improved electrical security fence; possibly with beams, pepper spray etc.
9. All telemetry and communication to the main SCADA to be incorporated, this will allow for automatic stop/start, level control, flow control etc.

4.3.3 Key Constraints

The location and design of the facilities for the Cyferfontein off channel storage dam abstraction facilities are constrained by the following key factors:

1) Gravity line limits distance of booster bump station from abstraction pump station.
    - Pump station to be positioned as close as possible to dam wall.
2) Soil conditions around dam wall will not be suitable for construction.
    - Structure to be built with pile foundations or on an excavated soil mattress
3) No construction permitted on or near the storage dam wall.
    - Pump station to be situated far enough from the dam wall to mitigate any effect of construction.
4) Accessibility of the facilities for operation and maintenance purposes.
    - The facilities should still be operable and maintainable during certain low-level flood events.
5) Theft and Vandalism
    - The facilities should be protected against theft and vandalism and access to equipment should be limited to facilitate this. The location of the abstraction works is also remote enough to be considered low risk of vandalism and theft.

4.3.4 Conclusion

Due to the size of pumps, security concerns and restriction of construction on or near the dam wall it was decided that a booster pump station would be situated away from the off-channel storage dam in order to transport the water to the new centralised water treatment work. Sand traps would assist in removing sediment from the raw water. Pumps, fittings and spares would be secure in the pump station structure.

4.4 Pump Service Life Considerations

The sediment content in the raw water will have significant impact on the service life of a pump. The wear on the impellers and pump casing increase dramatically with an increase of sediment content in the water. Figure 17 (published by Grundfos Pumps) illustrates the severe nature of pump wear due to sand content in the water being pumped. The operating pressure of the pump further aggravates pump wear as sediment content increases.

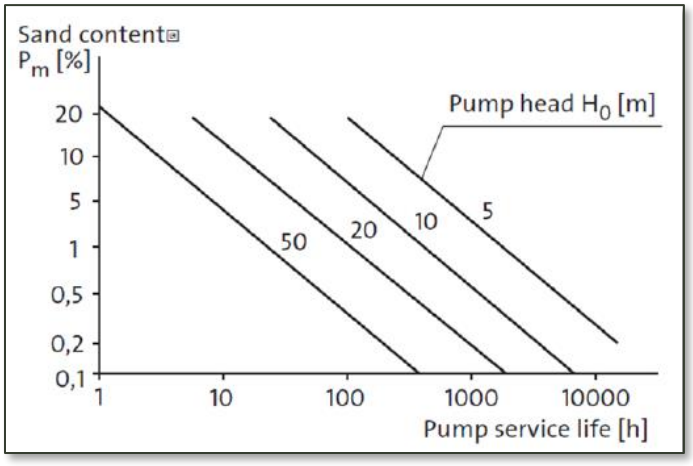


Figure 17 - Typical Pump Service Life Curves (Grundfos)

The negative effects in the service life of a pump can be mitigated in these circumstances by use of hardened materials and specialised hardening coatings for the impeller and casing.

However, in the attempt to reduce sediment content, sight should not be lost of the relationship between the cost of reducing sediment in the water versus the cost of regular pump refurbishment or replacement. In other words, it may be more cost effective to accept some degree of wear to the pumps due to sediment content, rather than building a very expensive facility to eliminate virtually every sediment particle in the water.

4.5 Water Quality Considerations

Seasonal Sand River raw water quality testing was carried out on raw water samples. These raw water quality test results were submitted to the process design team in order for an in-detail analysis to be conducted.

It should be noted that the water quality in a river system, such as the Sand River, will have fluctuations over time, as impacted by runoff from various storms in the catchment areas. High turbidity transported sediment and other floating/buoyant debris are to be expected during high flows and must be catered for in the design of an abstraction works.

4.6 Specifications

4.6.1 Applicable SANS 1200 Standardized Specifications

For the purpose of this contract the following SANS 1200 Standardized Specifications for Civil Engineering Construction shall apply:

SANS 1200 A	:	General
SANS 1200 AB	:	Engineer's Office
SANS 1200 C	:	Site Clearance
SANS 1200 D	:	Earthworks
SANS 1200 DB	:	Earthworks (pipe trenches)
SANS 1200 DE	:	Small Earth Dams
SANS 1200 DK	:	Gabions and Pitching
SANS 1200 G	:	Concrete (structural)
SANS 1200 H	:	Structural Steelworks
SANS 1200 HA	:	Structural Steelworks – Sundry Items
SANS 1200 HC	:	Corrosion Protection of Structural Steelwork
SANS 1200 L	:	Medium-pressure pipelines
SANS 1200 LB	:	Bedding (pipes)
SANS 1200 LK	:	Valve Installations (08/06)
SANS 1200 LQ	:	Manufacture of medium pressure steel pipes (08/06)
SANS 1200 LR	:	Corrosion protection of steel pipes and cast-iron fittings (05/96)

4.6.2 Particular Specifications

Specification AUR 0003	: General Corrosion Protection for Pipelines, Water and Wastewater Works.
Specification AUR 0005	: Quality Control
Specification AUR 7001	: Design and Manufacture of medium pressure Steel Specials
Amendments to AUR 7001	: Design and Manufacture of medium pressure Steel Specials
Specification AUR 7002	: Manufacturing of Medium Pressure Steel Pipelines
Amendments to AUR 7002	: Manufacturing of Medium Pressure Steel Pipelines
Specification AUR 7003	: Laying and Jointing of Medium-Pressure Steel Pipes and Specials
Specification AUR 7005	: Corrosion Protection for Valves
Specification AUR 7007	: Sluice Gates
Specification AUR 7016	: Resilient Seal Gate Valve
Specification AUR 7023	: Pipe Couplings and Flange Adaptors
Specification AUR 7024	: Pipework Supports
Specification LK	: Valve Installation
Specification PD	: Building Work
Specification PA	: Fencing
Specification ME1	: Structural Steelwork
Specification LE01	: Plain and Reinforced Concrete
Specification LE04	: Piling
Specification LE05	: Smooth Surface and Exposed Aggregate Surface Finishes
Specification LE06	: Concrete Screed
Specification LE10	: Concrete for Aqueous Liquid-Retaining Structures
Specification LE11	: Structural Concrete - Minor Works
Specification LE13A	: Concrete Surface Beds

5 Permissions/Regulatory Requirements

5.1 Wayleaves

No wayleaves required. Pump stations are situated on Municipal property (town grounds)

5.2 Water Use Licence Application (WULA)

An updated Water Use License will need to be submitted to the Department of Water and Sanitation for the increased water abstraction. This Process is already underway and is being conducted by MDA

5.3 Servitudes and Land Acquisition

No land acquisition or servitudes required as all works are situated on Municipal property (town grounds)

5.4 Occupational Health and Safety

An Occupational Health and Safety specification for the site must be developed to cover the particular hazards foreseen for the construction work, which the construction contractors must comply with.

6 Control and Instrumentation

6.1 Scope of works

The scope of works for the electronic installation (Control & Instrumentation equipment) is the design, supply, delivery, installation, testing, commissioning and upholding during the trial operation period and the defects notification period of the following equipment and materials:

1) Telemetry system as main communication medium between Sand River abstraction, Cyferfontein booster pump station, Cyferfontein dam abstraction and the new centralised water treatment works inclusive of a repeater station.
2) Three HMI (Human Machine Interface) including Programmable Logic Controllers (PLCs) installed in MCCs (Motor Control Centre) at Abstraction and Booster pump stations.
3) Control System Functional Design Specification (describing how the PLC and SCADA will be programmed to meet the Process Control Philosophy) before programming commences.
4) Programming of the PLCs and HMIs.
5) Uninterruptible power supplies for the control system.
6) Process Instrumentation, level and flow sensors installed at Abstraction and Booster pump stations.
7) Protection instrumentation, pressure sensors at Booster pump station.
8) Control and instrumentation cables including data communications cables
9) Earthing and surge protection for power, instrumentation and control components

7 Bulk and Small Power Detail Design

7.1 Design Overview - Standards, Specification & Regulatory Compliance

National Statutory Regulations

ACT No. / Year issued	Description
41	Electricity Act
85/1993	Occupational Health and Safety Act
29/1996	Mines Health and Safety Act
50/1991	Minerals Act
73/1989	Environmental and Conservation Act
31/1963	Fencing Act
122/1984	Forest Act
63/1970	Mountain Catchment Areas Act

All designs comply with the various SANS standards and NRS codes and on completion all installations will be certified with the issuing of Certificates of Compliance in terms of SANS 0142-1 & 2. All voltage drop calculations will be within the required ±10% from source to supply point. Lighting designed levels comply with the Machinery Regulations and supplementary SANS standards. DigSilent (Power Factory) and Dialux programs are utilized to verify design requirements.

Guidelines and Recommended and Standard Codes of Practices:

No. / Year Issued	Description
SAIC/1990	SA Steel Construction Handbook
NWP 3109	Standard Drawing Practice
TMH1/1986	Standard Methods of testing Road Construction Materials
CSRA / 1987	Standard Specification for Road and Bridge Works
SANS 0157	Quality Management System
SANS 03	Code of Practice – Protection of structures against lightning
SANS 0292	Code of practice for the application of CNE on low voltage distribution systems
DTS 0060	Power line crossings of proclaimed roads, railway lines, tramways and important communication lines
SANS 10280	Code of Practice for Overhead Power Lines for Conditions Prevailing in South Africa

SANS/SANS/NRS/BS/ANSI/IEC and Other Specifications

SANS/SANS	Other Spec	Description
ELECTRICAL		
SANS 1418, Part 1 tot 3 DTS 0105 (NRS 018)		Aerial Bundled Conductor
	NRS 051	ABC – Suspension and Strain fittings
SANS 135		Bolts and Nuts
SANS 178		Bolts, Eye
SANS 1195		Busbars
SANS 1632	BS 6290	Batteries
SANS 1652		Battery Charger
	BSS 3858	Binding/Identification Sleeves for Cables and Wires
SANS 1268: 1979 NRS 016: 1991		CNE
SANS 0198: 1988		Cables, installation of electric
NRS 012: 1991 SANS 1507		Cables, low voltage - Solid Dielectric Insulation (PVC) 300/500 to 1900/3300V
SANS 150 - 1970		Cables – PVC Insulated and Flexible Cords
NRS 013: 1991		Cables, medium voltage
		Cables – Cross-Linked Polyethelene (XLPE) 3.8/6.6 to 19/33kV
SANS 97/91		Cables – PILC 3.3/3.3 to 19/33kV
SANS 1213 SANS/IEC 60529		Cable Glands
	NRS 028	Cable lugs and ferrules
	NRS 075	Cable lugs and ferrules – Mechanical Torque sheer connectors
SANS 808		Cable Ties
DTS 0086 (NRS 020)		Clamps (strain for split concentric)
DTS 0086 (NRS 020)		Clamps (suspension for split concentric)
SANS 178		Clamps Strain
SANS 178		Clevis Tongue Adaptor (twisted)
SANS 10142		Clips for Wiring
SANS 1091		Colors - Standard
	BS 3288 Part 1 (Tests)	Compression Fittings
SANS 470	DTS 0106	Concrete Poles
SANS 182		Conductor ACSR/AAC and AAAC

DTS 0087 (NRS 021)		Conductor, Covered
		Conduit Saddles
		Conduit
NRS 028		Connectors, lug/termination
EDF 6737/HN 33 E60 (Main cable 350 mm² to 70 mm² take off 6 mm ²to 35 mm ²)		Connectors, insulation piercing
	BS 3288 (Tests)	Connectors, mid-span/full tension
SANS 0162		Connectors, mid-span/no tension
SANS 1200 H/HA		Connectors
SANS 1092		Contactors
SANS 0162		Cross Arm Braces
SANS 1200 H/HA		Cross Arms
SANS 1063		D Fuses
	IEC 60529	Degrees of Protection of Enclosures for LV SG en Control
SANS 0199 SANS 1063 SANS 1524-1		Earthing rods, couplers & clamps
	NRS 009-1	Electricity Dispenser
	BSS 152	Electric Power Switchgear and Associated Apparatus
SANS 1222		Enclosures for electrical equipment classified by IP code
	NRS 008	Enclosures to Cable terminations in Air: For rated AC voltages of up to 7.2kV and up to 36kV
	BSS 1767	Grommets
SANS 8528		Generators – Diesel Alternators Sets
SANS 0198/1988		Installation of electric cables
SANS 177		Insulators for Overhead Lines above 1000V
SANS 950		Impulse Tests for Power Cables
	NRS 068	Indicator – Earth Fault
	NRS072	Indicator – Overhead line fault path indicator

	BSS 158	Marking and Arrangement for Switchgear Busbars Main and Auxiliary Wiring
SANS 156		Moulded Case Circuit Breakers
SANS 1029		Miniature Substations
SANS 1091		National Color Standards for Paint
SANS 0200		Neutral earthing in medium voltage industrial power systems
SANS 555		Oil – Mineral for Transformers, Switchgear
	BSCP 1014	Protection of Electrical Power Equipment against Climatic Conditions

SANS 1619		Ready Boards
	NRS 036	Re-closers – Pole Mounted
	DTS 0104 (NRS 032)	Service box
		Stainless Steel Straps and Buckles
SANS 0162	BS 16	Stay Assemblies
SANS 0162	BS 16	Stay Attachment Brackets
SANS 0162	BS 16	Stay Insulators
SANS 182, Part 5		Stay Wires
SANS 1507		Suffix Wiring
SANS IEC 99-4	NWS 1108 BS 2914	Surge Diverters
SANS 171		Surge Arresters – Low Voltage
	NRS 039	Surge Arresters – Medium Voltage
SANS 1186 / 1978		Symbolic Safety Signs
	NRS 036	Switchgear: Metal Clad – 1 to 24kV AC RMS
SANS1874	NRS 006 BS 5227	Switchgear: Metal Enclosed Ring Main Units – 1kV AC to 24kV AC RMS
SANS 60439		Switchgear and Control Gear Assemblies – Low Voltage – Requirements for Type testing
SANS 60947		Switchgear and Control – Low Voltage Part 1 General Rules Part 2 Circuit Breakers Part 3 Switches/Isolators/Switch Isolators and Combination switches
SANS IEC 947-4-1		Switchgear & Control Gear – Low Voltage
	NRS 035-1	Switchgear – Drop-out Fuse link, Solid Links, Pole mounted – up to 33kV
	NRS 036	Switchgear: Sectionalisers and Reclosers – Pole Mounted
	NRS 046	Switchgear: Load-break Disconnectors, Pole mounted, to 36KV
	BS 464	Thimbles
SANS 780		Transformers, Self-protected
	NRS 054, BS 171 IEC 60076; NWS 1532	Transformer - Power
SANS 780		Transformer - Distribution (2 MVA Max)
	NRS 02 IEC 44 IEC 185	Transformers – Current: 3,6kV to 420kV
	NRS 030 IEC 44 IEC 185	Transformers - Voltage
	NWS 1827	Transmission line hardware
SANS 60-2		Test Techniques for High Voltage – Measuring Systems

SANS 135		Washers
SANS 182		Wire, PVC Covered
BS 462		Wire Rope Grips
		Wire, Stranded Copper, bare
SANS 753		Wood Poles – Pine
SANS 754		Wood Poles – Gum
		Zinc coatings, hot dipped galvanized
	IEC 60871-1	Shunt Capacitors
	IEC664	Insulation Coordination - LV Networks
	IEC 71	Insulation Coordination – above 1kV
	IEC 273	Dimensions of Post Insulators
	IEC 168	Tests on Insulators
	IEC 815	Guide for selection of insulators for polluted conditions
	IEC 62271-200 (Prev 60298 & 60694)	Construction of medium voltage switchgear and control gear assemblies
	IEC 62271-100	Construction of medium voltage circuit breakers
	IEC 62271-102	High voltage alternating current disconnectors and earthing switches
	IEC 60076-6	Iron Core Reactors
	IEC 60549	High Voltage fuses for external protection of power capacitors
	IEC 60420	High Voltage Contactors
SANS / IEC 694		Common Clauses for HV switchgear & control gear standards
	IEC 44-4	Tests – Partial Discharge - Measurement
	IEC 270	Test – HV Testing methods, measurements of partial discharge
	IEC 60-1,2 & 3	Tests – HV – Test Techniques
	IEC 70	Capacitors

7.2 Main Power Supply & Small Power:

1) Replace 11kV Protection on Pump Station Feeder circuit breaker to include OC/EF, Sensitive Earth Fault and Auto Reclose functionality in Sevenster Substation.
2) Re-direct 11kV overhead line feeder to new position next to road in pipeline servitude.
3) First pole to be protected by ClearVu 2.4m high fence adding welded ripper razor mesh.
4) Last pole will terminate inside yard at booster pump station position.
5) Erect Fox conductor T-Pole (11m) construction overhead line on route to booster pump station supplied from existing 11kV cable from Sevenster Substation.

6) Supply 12 x 50kVA Pole Mounted Transformers with metering kiosk for supply power to each small holding.
7) Demolish existing Fox overhead line with Wooden poles including 10 x existing small holding connection points. Materials to be returned to Municipal Stores.

7.3 Booster Pump Station:

1) Civil Works will erect substation with pump station.
2) Install BCEW earth mat and lightning protection.
3) Supply and install 1000kVA 11/0.4kV Miniature Substation.
4) Supply and Install 500kVA Diesel Standby Generator.
5) Supply and Install MCC for 2 x 260kW Standby/Duty Raw water pumps including VSD's, measurement and control systems with PLC. The main busbar will be split with a Socomec change over switch and supply power to emergency pumps. The main Booster Pumps should be capable to operate in Duty/Duty configuration only in normal main power and not in emergency mode.
6) Supply and Install 550kVAr Power Factor Correction Panel with 5 x 100kVAr and 1 x 50kVAr capacitor steps.
7) Supply and Install Building small power as specified on drawings.
8) Supply ClearVu 2.4m high fence with one truck gate around adding welded ripper razor mesh and smart coil electric fence.
9) Supply and install Pepper Gas Intrusion system.

7.4 Abstraction Works Station (Dam & River):

1) Civil Works will erect new river abstraction pump station tower and the existing dam abstraction walkway will be replaced.
2) Install lightning protection to river tower and dam walkway.
3) Supply and Install Dam abstraction MCC to control 2 x 18.5kW Submersible pumps. These Pumps will be controlled from a PLC/HMI situated inside the Booster Pump Station.
4) The River abstraction MCC will include its own PLC/HMI and lick with a UHF antenna to the Booster Pump Station
5) Supply and install a vandalized proof Kiosk as indicated close to the river abstraction. This kiosk will be supplied from the Booster Pump Station MCC and will provide power to the existing boreholes and the River Abstraction MCC.
6) Supply and Install MCC for 2 x 45kW Standby/Duty Raw water submersible pumps including VSD's, measurement and control systems with PLC.
7) Supply and Install all small power as specified to both Abstraction Pump Stations.

7.5 Drawings

Record Drawings

(a) It is a requirement of this contract that detailed “as-built” drawings of the Works must be provided by the Contractor after completion thereof, on which all details regarding the final installation are clearly indicated. Three-sets of drawings printed to their original size shall be provided by the Contractor. Drawings larger than A3, shall be printed with reduced scaling, but without omitting any information from the printed area, to A3 size.

(b) All drawings and schematics shall have been generated by a computer aided design (CAD) package (handwritten documents will not be accepted). The drawings and schematics shall be (where applicable) to scale and must be formatted and styled in accordance to the client and/or Engineer’s requirements (with regards to title blocks, text heights, drawing names, etc.). A compact disc containing these files, in both CAD and printable document (pdf) format, as well as any and all available electronic versions of relevant data sheets etc. must also be handed over to the Engineer.

(c) All “as-built” drawings and schematics must be submitted not later than two (2) weeks after the work has been completed.

(d) These drawings need to be approved by the Engineer prior to completion of the Works.

Manufacturing Drawings

The contractor shall submit manufacturing drawings for comments and approval as soon as possible. These manufacturing drawings shall at least include the following:

(e) General layout drawings of the different equipment to be installed under this contract;

(f) The internal construction of the different equipment to be installed under this contract;

(g) Complete wiring diagrams of the equipment to be installed under this contract;

(h) A detailed parts list containing all components of the different equipment that will be installed under this contract. This parts list shall contain detail such as serial numbers, supplier detail, etc.

Manufacturing drawings for approval shall be provided on A3 paper copies. No manufacturing shall proceed without the approval of the drawings.

7.6 Operation and Maintenance Manuals

(a) The contractor will submit operating and maintenance manuals in triplicate format. These manuals should contain all the relevant literature, drawings, schedules of installed equipment, procedures, write-ups, type and routine test certificates, etc. which are applicable on the installed equipment and material.

(b) These manuals should be properly indexed and shall be in A4 format.

(c) The manuals shall be properly labelled with the contract details and a complete description of the works.

(d) A sample manual will be submitted to the engineer for approval before the final copies will be compiled.

(e) The manuals will be bind in durable format with suitable plastic covering for protection.

(f) No First Taking-over Certificate will be issued before all the manuals have not yet been received.

(g) In each manual a CD of the complete manuals including as built drawings

will be included in suitable pockets. The contractor will submit operating and maintenance manuals in triplicate format. These manuals should contain all the relevant literature, drawings, schedules of installed equipment, procedures, write-ups, type and routine test certificates, etc. which are applicable on the installed equipment and material.

(h) These manuals should be properly indexed and shall be in A4 format.

(i) The manuals shall be properly labelled with the contract details and a complete description of the works.

(j) A sample manual will be submitted to the engineer for approval before the final copies will be compiled.

(k) The manuals will be bind in durable format with suitable plastic covering for protection.

(l) No First Taking-over Certificate will be issued before all the manuals have not yet been received.

(m) In each manual a CD of the complete manuals including as built drawings will be included in suitable pockets.

8 Pump Station Structural Detail Design

8.1 Design Overview

8.1.1 Cyferfontein Off Channel Storage Dam Extraction

The new steel support structure for the 400mm Ø HDPE pipeline will span between the existing concrete pump shaft structure and the top of the dam wall. The total length of the steel structure will be approximately 32m in length.

The new steel support structure will be fixed directly to the existing concrete pump shaft structure and a reinforced concrete pad foundation will be founded in the top portion of the dam wall. The top 1125mm in-situ material below the footprint of the concrete pad foundation will be removed. This will allow for a 300mm thick reinforced concrete pad foundation, 75mm thick concrete blinding layer and 300mm layer suitable clayey gravel material compacted in 150mm layers to 98% Standard Proctor. The top of concrete level for the pad foundation and the top of concrete level for the existing concrete pump shaft structure will be at the same level.

To allow for differential movement between the two support structures, steel plates will be cast into the new concrete pad foundation. The new steel structure will be positioned on top of these steel plates, the plates will be greased to enable horizontal movement.

The steel structure will mainly consist of two vertical trusses with horizontal bracing members. The main top and bottom chords of the truss will be manufactured from 90x90mm equal leg angle iron while the rest of the vertical and diagonal (horizontal and vertical) members will be 80x80mm equal leg angle iron.

8.1.2 Sand River Abstraction

The new reinforced concrete abstraction structure will be founded directly on hard rock (Sandstone) ±8.32m below natural ground level. The footprint of the pad foundation will approximately be 9.9m x 6.5m, dowel bars will be provided to anchor the structure to hard rock. The size of the inlet structure (outside dimensions) itself will be 5.5m x 4.93m, leaving a 4.5m toe on the pad foundation. G7 material will be backfilled on top of the toe of the foundation to add counterweight to the structure.

75mm Blinding layer will be provided below the pad foundation to ensure an even working platform.

Walls will be designed to ensure that crack width is limited to 0.2mm and the thickness of the walls will decrease at mid height as the loads acting in on the walls decrease. The walls' thicknesses vary from 500mm to 400mm.

The 170mm thick concrete roof slab will be supported by down stand concrete beams. Where it is required the lift out the pumps, 100mm thick precast concrete panels (2.4m x 0.463m) are proposed. This will allow to access the pumps when necessary and heavy enough that it is not moved by hand to prevent theft.

Two steel crawl beams (305x146x31kg/m I-section) will be positioned centred over each pump unit. The crawl beams will be fixed to a structural steel framework. The steel frame structure will be bolted to the roof slab/ top of walls. The crawl beams will clear the edge of the structure by 2m to ensure sufficient space to lower/lift the equipment onto/from a vehicle below.

Fibregrate cat ladders are proposed to access the abstraction structure. The Fibregrate cat ladders replaces the conventional galvanized and stainless-steel ladders as they have a reduced risk of being stolen.

8.1.3 Cyferfontein Booster Pump Station

The new reinforced concrete booster pump station will be founded on top of the final bulk earthworks level which will be close to natural ground level. The footprint of the total structure is approximately 30.5m x 18.5m.

According to the Geotechnical report soft rock dolerite is encountered around 3m below natural ground level, which is a suitable founding material for the structure, however groundwater was encountered at a depth of 1.5m below natural ground level. Excavation will be done up to 3m, the first 1.5m of the excavation will be backfilled with dump rock and choked with a layer of 19mm gravel/stone. The upper 1.5m portion of the excavation will be backfilled with G6/G7 material in layers of 150mm, each layer compacted to 95% MOD AASHTO.

Concrete foundation slabs for water retaining areas will generally be 400mm thick, with 300mm thick foundation slabs for the pump and generator room individually. No spread foundations will be provided.

The concrete walls will vary from 220mm – 350mm thick. For water retaining areas the walls will be designed to ensure that crack width is limited to 0.2mm. Predefined vertical and horizontal construction joints will be set out for the contractor to assist with the construction of the walls at water retaining areas. All vertical joints will be constructed with flexible PVC joint system centred in the wall vertically up or down at the specified joint position and horizontal wall joints will receive a hydrophilic rubber seal in the middle of the joint to ensure a watertight structure.

A 250mm thick roof slab is proposed over the pump room and generator room areas spanning between the walls. Upstand concrete beams are provided at mid-span to reduce the span length of the roof slab.

Pre-cast sliding vault doors are provided for all entrances which will help in preventing vandalism of the equipment inside the pump station. The door into the pump room will be wide enough for a vehicle to enter to load/offload equipment.

A 203x203x46kg/m I-section crawl beam will be fixed to the soffit of the roof slab, centred over the pump units.

All walkways above channels will be covered with Fibregrate moulded grating. The Fibregrate moulded grating replaces the conventional galvanized Rectagrid grating as they have a reduced risk of being stolen.

8.2 Applicable Statutory and Regulatory Requirements

- SANS 10400: “Code of Practice for the application of the National Building Regulations”
- SANS 10160: “General Procedures and Loadings for the design of buildings”
- SANS 10161: “The design of foundations for buildings”
- SANS 10162: “Structural Use of Steel”
- SANS 10100: “Structural Use of Concrete”
- BS 8007: “Code of Practice Design of concrete structures for retaining aqueous liquids”

8.3 Structural Specifications

- LE 1 – Specification for Plain & Reinforced Concrete
- LE 5 – Specification for Smooth Surface and Exposed-aggregate Surface Finishes
- LE 6 – Specification for Concrete Screed
- LE 10 – Specification for Concrete for Aqueous Liquid-Retaining Structures
- LE 11 – Specification for Structural Concrete - Minor Works

- LE 16 – Specification for Soilcrete
- ME1 – Specification for Structural Steelwork
- TE1 – Specification for Alternative Designs of Structures or Structural Elements

8.4 Design Loads

All loads are calculated in accordance with SANS10160.

8.4.1 Wind Loads

A mean return period of 100 years will be used.

8.5 Materials

The following structural materials and their corresponding strengths will be adopted in the design:

8.5.1 Concrete

All water retaining structures to be constructed with Class 35/19 concrete or as outlined below:

- Pad Foundations : Class 25/19
- Foundation Slabs : Class 35/19
- Columns/Walls : Class 35/19
- Plinths : Class 35/19
- Roof Slabs : Class 35/19
- Mass Concrete : Class 15/19
- Blinding Layers : Class 15/19

8.5.2 Concrete Mix

8.5.2.1 Cement and water content of the concrete

The specification requires a minimum cement (OPC) content of 325kg/m3 with maximum water : cement ratio of 0.55 for ordinary Portland cement (OPC), CEM 1 42,5 to ensure a durable and water tight concrete water retaining structures. Minor hair line cracks that may appear due to mainly shrinkage once the reservoir is filled up will cause limited wet spots or slight seepage on the walls, but the high cement content ensures that these cracks seal themselves within the first few months.

8.5.3 Reinforcement

All reinforcement and bending schedules will be to the relevant SANS standards and design strength (fy) will conform to the following:

- High tensile reinforcement (Y): 450 MPa
- Mild steel reinforcement (R): 250 MPa

8.5.4 Structural Steel

Structural steelwork will be specified to SANS standards. Hot rolled steel sections shall be Grade S355JR minimum. Cold formed sections shall be 200MPa

8.6 Durability

8.6.1 Concrete

The exposure conditions for the site as defined in clause 2.4.1 of SANS 1200G is assumed to be as follows for all concrete elements.

Structural Concrete Elements:	**Exposure Condition:**
All concrete elements will be exposed to:	Severe Conditions

For concrete elements, durability will be achieved by adopting a combination of the following measures:

Specifying high quality, dense, low permeability concrete

Specifying adequate w/c ratio as per SANS 1200G

Specifying adequate reinforcement cover

Using SANS10100 as guide the proposed cover for reinforcement are as follows:

- Foundation Slabs - 50mm
- Roof Slabs - 40mm
- Beams - 40mm
- Walls - 40mm

8.6.2 Structural Steelwork

The corrosion protection on the exposed structural steelwork will be either paint protected or galvanized (as appropriate).

All steelwork (including bolts) except for gantry beams which will be hot-dipped galvanized, will be treated with ABE Rustopak Red Penetrant sealant and ABE Rustopak Top Coat or a similar approved product.

8.7 Temporary Works

All temporary works shall be designed and constructed to produce concrete/structural steel elements which will conform within the specified tolerances to the shapes lines, levels, dimensions and surface finish required by the Design Documents.

The responsibility for the sufficiency and design of the whole temporary works (inclusive of any crane lifts) rest entirely with the Contractor.

Computations where required shall be prepared by a **registered professional engineer, experienced in the design of formwork and falsework**.

The Contractor is to ensure that all temporary loading, for materials storage, etc, during the construction stage is limited to the design loading for the permanent conditions.

8.7.1 Cyferfontein Off Channel Storage Dam Extraction

The steel support structure must be assembled to the side of the dam wall and lifted into place with a mobile crane. The crane will be positioned to the side of the dam wall on the non-retaining side, with the outriggers positioned as close as permitted to the dam wall. The approximate required crane reach is 55m, with a minimum safe lifting capacity of 10t. Approximate mobile crane size required is 400/450t.

9 Security:

Security is less of a concern at Cyferfontein. Existing pump stations show little signs of attempted vandalism or theft. This could be due to the fact that it is not situated in close proximity to any informal settlement. Security measures will be implemented and put in place to ensure the safe guard of the infrastructure, mechanical and electrical equipment as well as operators/personnel.

After a consultation with colleague's in the bulk water supply industry in Gauteng (Johannesburg), we raised the concern of the excessive theft and vandalism on the infrastructure and equipment in Senekal. During this consultation they informed us that they are currently implementing "Fortress Pump Stations" with great success in areas of high security concern. These pump stations are constructed entirely from reinforced concrete, with no windows, louvres etc. Heavy concrete sliding doors constructed of 60Mpa concrete with extremely robust locking mechanisms are also specified. Aurecon was also recently involved during the construction of a similar pump station in Botshabelo close to Bloemfontein. A typical detail drawing and example of such a "Fortress Pump Station" is attached under **Appendix C**. The option of constructing the pump stations in underground "bunker like" pump stations can also be considered.

Implementing a centralised main SCADA and Motor Control Centre (MCC) for controlling the entire scheme, at the WTW, will also be utilized to move expensive equipment away from the pump stations at the sources where security is problematic. This means that only a small theft prove kiosk (with pump relays) will be installed at each pump station. As the expensive equipment is located at one centralised position at the WTW in town, these relays and kiosks are quick and easy to replace/repair should vandalism or theft ever occur. This will also assist in moving expensive equipment above the flood line levels which will also protect the equipment during floods. Communication between the main MCC and SCADA will be done remotely. This also means that an operator will only ever need to visit the pump stations should a fault occur, and an inspection be required. A line of sight investigation has already been conducted to determine if it would be possible to operate the entire system remotely from the centralised WTW. Please refer to a typical detail drawing and example of the kiosks mentioned above under **Appendix D.**

Additional measures that can be implemented at the new pump stations, boreholes and water treatment works to safe guard equipment and operators/personnel:

- Vandal proof stainless steel doors.
- Concrete vault doors to ensure access control into all pump houses etc.
- The positioning of structures and infrastructure should be considered.
- Security system installation, including an alarm system, cameras, beams, pepper spray (tear gas) etc.

- Better security fencing and access control e.g. Clearvu Fencing with electrical fencing on top of the Clearvu Fencing.
- Due to the remote location of Senekal and the works, armed response poses a challenge. Several recognized Security companies advised that only monitoring is possible, and once alarms are triggered, they then contact South African Police Service (SAPS) to attend to the alarm.

10 Engineer's Cost Estimate

Cyferfontein Abstraction Works – CIVIL WORKS: Cost Estimate			
SECTION A:	Preliminary and General	R	5 792 670.89
SECTION B:	Sand River Abstraction Pump Station and Associated Works	R	15 140 878.79
SECTION C:	Booster Pump Station and Associated Works	R	7 251 470.00
SECTION D:	Cyferfontein Dam Tower Abstraction Pump Station and Associated Works	R	1 587 775.00
SECTION E:	Rising Main from Sand River Abstraction Pump Station to Cyferfontein Off-Channel Storage Dam	R	3 572 659.61
	Total Priced Items:	R	33 345 454.29
	Allow 10% Contingencies:	R	3 334 545.43
	Net Total for Project:	R	**36 679.999.72**
	Add 15% for Value Added Tax:	R	5 501 999.96
	Gross Total Estimate for Project:	R	**42 181 999.68**

Cyferfontein Abstraction Works – MECHANICAL & ELECTRICAL WORKS: Cost Estimate			
SECTION A:	Preliminary and General	R	3 085 700.00
SECTION B:	Small Civil Works	R	409 300.00
SECTION C:	Mechanical Works – River Abstraction	R	1 796 560.00
SECTION D:	Mechanical Works – Booster Pump Station	R	3 582 430.00
SECTION E:	Mechanical Works – Cyferfontein Dam Abstraction	R	2 260 947.00
SECTION F:	Small Electrical Works	R	365 120.00
SECTION G:	Bulk Electrical Works	R	13 942 692.00
SECTION H:	Electronic Installation	R	1 241 448.00
	Total Priced Items:	R	26 684 197.00
	Allow 10% Contingencies:	R	2 668 419.70
	Net Total for Project:	R	**29 352 616.70**
	Add 15% for Value Added Tax:	R	4 402 892.51
	Gross Total Estimate for Project:	R	**33 755 509.21**

11 Conclusions and Recommendations

Based on this Detail Design Report it is recommended that the Sand River abstraction pump station facilities and the Cyferfontein raw water abstraction and booster pump stations be implemented as follows:

11.1 Sand River Abstraction Pump Station:

1. Raw water flows through short gabion channel to the abstraction pump station (example seen in Figure 8 below)
2. The water enters the structure through two (2) inlet screens.
3. Submersible raw water pumps pump water approximately 575m into a 155m gabion/earth channel where from the water will gravitate into the Cyferfontein off-channel storage dam.
4. Duty point will be 108 l/s to 180 l/s at 26.555m (static head = 22.12m). This will depend on the output of the Sand Spruit abstraction works.
5. Duty/standby setup with both the duty and standby pumps being able to supply 60% of the total daily demand each (108 l/s). For 100% of the total daily demand the duty and standby will operate simultaneously to achieve 180 l/s. This means the variable speed drive will take each pump's delivery down to achieve 180 l/s.
6. Pumps to be variable speed drive with soft starters, capable of handling solids of up to 40mm
7. Discharge pipeline is proposed as DN400mm, class 12.5 PVC-O pipe. Erosion protection as well as energy breakers to be incorporated at point of discharge into the trapezoidal gabion channel.
8. Areas where access is required will be enclosed with heavy duty pre-cast concrete slabs.
9. There will be no visible equipment.
10. New and improved electrical security fence; possibly with beams, pepper spray etc will be implemented to protect against theft and vandalism.
11. All telemetry and communication to the main SCADA to be incorporated, this will allow for automatic stop/start, level control, flow control etc.

11.2 Cyferfontein Storage Dam Abstraction Pump Station:

1. Raw water abstracted directly from Cyferfontein off-channel storage dam.
2. Submersible raw water pumps will pump raw water approximately 40m after which it will gravitate a further 58m to the new booster pump station.
3. Duty point will be 108 l/s to 180 l/s at 16m (static head = +-12m).
4. Duty/standby setup with both the duty and standby pumps to be able to supply 60% of the total daily demand each (108 l/s). For 100% of the total daily demand the duty and standby will

operate simultaneously to achieve 180 l/s. This means the variable speed drive will take each pump's delivery down.

5. Pumps to be variable speed drive with soft starters, capable of handling solids of up to 40mm
6. Discharge pipeline is proposed as DN400mm, mild steel pipe up until the open-ended tee. From the open-ended tee, the pipe will be continuously welded HDPE.
7. The new steel bridge upper platform will provide access to the pumps, while the lower platform will provide support to the pipework.
8. Pipework will be visible, but pumps will always remain submerged.
9. New and improved electrical security fence; possibly with beams, pepper spray etc. will be installed.
10. All telemetry and communication to the main SCADA to be incorporated, this will allow for automatic stop/start, level control, flow control etc.

11.3 Cyferfontein Booster Pump Station:

1. Water is pump over the Cyferfontein off channel storage dam wall by the Cyferfontein storage dam abstraction pump station and then gravitates to the booster pump station via the newly constructed 400mm dia. HDPE pipe.
2. Gravity line splits into two. Each line flows into a separate sand trap channel.
3. Settlement occurs and the water and sediment are separated. Water flows into pump station sump / balancing tank. From here the booster pumps abstract the water and transport it to the new centralised water treatment works in Senekal (+- 11070.00m away).
4. Duty point will be 108 l/s and 180 l/s at 87.4m and 128.4m respectively. (static head = +- 62.04m).
5. Duty/standby setup with both the duty and standby pumps to be able to supply 60% of the total daily demand each (108 l/s). For 100% of the total daily demand the duty and standby will operate simultaneously to achieve 180 l/s. This means the variable speed drive will take each pump's delivery down to achieve the 180 l/s.
6. Pumps to be variable speed drive with soft starters, capable of handling solids of up to 40mm
7. Discharge pipeline is proposed as DN400mm, PVC-O Class 16.
8. New and improved electrical security fence; possibly with beams, pepper spray etc.
9. All telemetry and communication to the main SCADA to be incorporated, this will allow for automatic stop/start, level control, flow control etc.

12 DETAIL DESIGN REPORT APPROVAL

1. **Signed: Setsoto Local Municipality:**

_____	_____	_____
Signature:	Date:	Position Held:

2. **Signed: Department of Water and Sanitation:**

_____	_____	_____
Signature:	Date:	Position Held:

3. **Signed: Consulting Engineer - Aurecon:**

_____	_____	_____
Signature:	Date:	Position Held:

Appendix A

Water Demand Calculations

Appendix B

Pump Station System Curves

Appendix C

Reinforced Concrete Pump Station and Vault Doors

Appendix D

Proposed Anti-Theft Kiosk Photo’s and Typical Detail Drawing

Aurecon South Africa (Pty) Ltd

1977/003711/07

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APPENDIX E

Public Participation

APPENDIX E_1

List of identified possible interested and affected parties

Abstraction Works: Senekal Bulk Water Supply	
Table 1: List of identified possible interested and / or affected parties	
Authorities & Stakeholders	
Organization	**Contact person and contact detail**
Thabo Mofutsanyana District Municipality	The Municipal Manager Ms. Takatso Lebenya Tel: (058) 718 1036 / 1089 Fax: (058) 718 1034 Email: Takatso@Tmdm.Gov.Za Private Bag X810, Witsieshoek, 9870 1 Maimpoi Street, Old Parliament Building, Phuthaditjhaba
Setsoto Local Municipality: Municipal Manager	Mr. Tshepiso "Sugar" Ramakarane Tel: (+27 51) 933 9302 Fax: (+27 51) 933 9363 Email: Tshepiso@Setsoto.Co.Za And Manager@Setsoto.Co.Za 27 Voortrekker Street, Ficksburg
Setsoto Local Municipality: Ward Councillor: Ward 3	Ward 3: Cllr. Mamotena Lydia Mthimkulu Po Box 116, Ficksburg, 9730
Department Of Agriculture	The Assistant Director Mr Jack Morton P.O. Box 34521 Faunasig Bloemfontein 9325
Department Of Public Works: Property Manager	Department Of Land Affairs Director Property Management Of The Provincial Department Of Public Works & Infrastructure Ms Agnes Ntilane 136 Charlotte Mareka Street Bloemfontein 9300 Ntilanea@Fsworks.Gov.Za
Department Of Water And Sanitation	Mr. W Grobler Private Bag X528 Bloemfontein 9300 Groblerw@Dws.Gov.Za
SAHRA	South African Heritage Resources Agency (SAHRA) Head Office 111 Harrington Street

Abstraction Works: Senekal Bulk Water Supply	
Table 1: List of identified possible interested and / or affected parties	
	Cape Town 8001 (Online Notification)
SAHRA Free State	Ntando PZ Mbatha Heritage Coordinator Corner Henry And East Burger Street Department Of Sport Arts Culture And Recreation Office 204 Bloemfontein 9301
Eskom	Phindi Rapudungoane Land And Rights Officer Tell: 051 4042284 Fax: 086 5398399 Phindi.Rapudungoane@Eskom.Co.Za Mahlatse Moeng Environmental Officer Land Development And Environment Eskom Distribution-FSOU Eskom Centre First Floor 120 Henry Street Westdene Bloemfontein Tel: 051 404 2287 Cell: 079 199 0679 Fax: 086 604 5709 Email: Mahlatse.Moeng@Eskom.Co.Za
CAA	Lizell Stroh StrohL@caa.co.za
Landowners And Adjacent Landowners	
Fairlands 834	No information available on Windeed
Remainder of the farm Hillyside 85	WJ Storm Trust jdheyns@enslins.com
Remainder of the farm Uitkomst 513	Ficksburg Abattoir Trust sinclairlouise31@gmail.com
Portion 1 of the farm Uitkomst 513	Jan Du Preez Trust jdheyns@enslins.com
Remainder of the farm Vista 733	Jan Heyns Trust jdheyns@enslins.com

Abstraction Works: Senekal Bulk Water Supply	
Table 1: List of identified possible interested and / or affected parties	
Portion 1 of the farm Zyfer Fontein 246	CJR Cilliers ilanie@oelofse.co.za
Remainder of the farm Zyfer Fontein 246	DALRRD eric.dutoit@dalrrd.gov.za / Rowlen.Ryan@dalrrd.gov.za
Portion 4 of the farm Zyfer Fontein 246	Setsoto Local Municipality

APPENDIX E_2

Proof of notification

Site Notices:

Advert:

OM TE ADVERTEER SKAKEL 051 404 7600 I AMPTELIKE KENNISGEWINGS: bloemnuuslegals@media24.com I GEKLASSIFISEERD: bloemnuusadverts@media24.com

Geklassifiseerd

STERFGEVALLE

STRYDOM

1951/11/05 - 2022/02/18

Die begrafnisdiens van Wyle Johannes Jacobus (Janna), 70, in lewe van Bloemfontein vind plaas op Vrydag 25 Februarie 2022 om 10:30 vanuit die NG Kerk Waterbron, Vergezochtlaan Waterbron waarna die stoet vertrek na die Bainsvlei begraafplaas vir die teraarde bestelling.

Extonweg 38, Hilton Bloemfontein
Tel: 082 484 6008

Bloemfontein

ALGEMENE KENNISGEWINGS

GEMEENSKAPS-KENNISGEWINGS
1410

RS AUCTIONEERS LIVE & ONLINE AUCTION!
25 FERBRUARY @ 10H00
*Computers
*Printers
*Furniture
*Office Appliances
HOME AFFAIRS
Department Home Affairs Republic of Soth Africa
Bidpro
Limousine Complex
Abrahamskraal Road,
Bainsvlei
Contact: Reuben 082 3744 388 or Suzette 082 411 3419
www.rsauctioneers.co.za

PERSOONLIKE DIENSTE

LENINGS
1445

Oorbruggings-kontant vir **Pensioen/Pakket** afwagtendes
Eiendomverkope
(Enkel bedrag)
086 110 1388
076 886 7655

TE KOOP

ALLERLEI
1555

EK KOOP GOEIE gebruikte klere, skoene, linne en kombuiswaregebruikte klere, skoene, linne en kombuisware kontant. Ek besoek u tuis. Skakel **072 185 8217.**

Ek koop tweedehandse meubels en werkende TV's, yskaste, vrieskaste, wasmasjiene, gereedskap, fietse, goud en voertuie. Ek kom na u toe en betaal kontant. Toppryse.
Marco 083 450 9400

ALGEMENE & HUISDIENSTE

BOUWERK & KONSTRUKSIE
1801

Algemene Nutsman: Staalwerk, Teëlwerk, Verf, Krane
¤083 707 7967

ELEKTRIES
1810

1-CALL Appliance Repairs:
Probleme met Yskaste, Wasmasjiene, Stowe ens: Herstel binne 24uur by u huis !
Skakel 073 363 9075

EK Koop Yskaste/V-kaste werkend of stukkend. Doen herstelwerk, gas en aanvulling.
Skakel 082 573 4737

Stoofkoning: Herstel stowe, wasmasjiene, skottelgoedwassers, tuimeldroërs ens.
083 303 0094

TE HUUR
1820

#VENUES
SALE te huur op skouterrein vir troues, funksies en spesiale skoue. Persele ook beskikbaar op langtermyn basis.
Skakel Juanita by
Tel: 051 444 8888/9/10
www.bloemshowgrounds.co.za

VOLWASSENES

PRIVAAT
2015

LOOKING FO SOMETHING SWEET? Fun and spicy, i promise no fairy-tale ending, at least not yet, but some good, smoot conversation. A shared bottle of wine here and there, a stolen kiss maybe and hopefully lots of laughs. I am a young beautiful yellow bone, Sotho petite 20 years old with lots of experience in massages.
Call: 066 1152 186

New hot young and sexy African Stunner. A babe with a excellent body, firm boobs, long legs to show off, in sexy heels. Meet me at my door with nothing on . Pvt, Tvl, 24/7. Tyra
Call 083 387 9238

BETREKKINGS
3600

BETREKKINGS GESOEK
3670

Ek soek huiswerk vir 5dae uitslaap. Ek kan afrikaans praat baie hardwerkend.
073 756 9376

REGSKENNISGEWINGS & TENDERS

ALGEMENE KENNISGEWINGS
4010

MANGAUNG METROPOLITAN MUNISIPALITEIT WET OP RUIMTELIKE BEPLANNING EN GRONDGEBRUIKBESTUUR, 2013 (WET NO. 16 VAN 2013)

Die aansoek tesame met die betrokke planne, dokumente en inligting lê gedurende kantoorure (08h00-15h00) ter insae in die kantoor van die Stad en Streek Beplanning Sub-direktoraat van die Mangaung Metro Munisipaliteit, Kamer 802, 8ste Vloer, Bram Fischer Gebou, H/v Nelson Mandela en Markgraafstraat, Bloemfontein vir 'n tydperk van 30 dae vanaf die datum van publikasie hiervan, naamlik Donderdag 24 Februarie 2022.

Enige persoon wat 'n belang by die saak het, en wat teen die toestaan van die aansoek beswaar wil maak of wat verlang om in die saak gehoor te word, of vertoë in verband daarmee wil indien, moet binne 30 dae na die datum van plasing hiervan sy beswaar / vertoë skriftelik indien by die Stad en Streek Beplanning Sub-direktoraat van die Mangaung Metro Munisipaliteit by bogemelde adres of e-pos: patricia.maasdorp@mangaung.co.za of pos aan Posbus 3704, Bloemfontein, 9300 binne die tydperk van 30 dae vanaf die datum van publikasie hiervan, naamlik 24 Februarie 2022 – 28 Maart 2022, tesame met jou naam, adres, kontakbesonderhede, belangstelling in die aansoek en redes vir jou kommentaar. Die Munisipaliteit mag weier om kommentare te aanvaar na die sluitingsdatum. Enige persoon wat nie kan skryf nie, sal deur 'n munisipale amptenaar bygestaan word om hul kommentaar op skrif te stel.

KENNISGEWING

Bloemfontein: Restant van Erf 26761, Restant van Erf 26762, Erf 28425 en Erf 40501, Bloemfontein Uitbreiding 77, Brandwag, Bloemfontein

Hiermee word die algemene publiek in kennis gestel ingevolge die bepaling van Artikel 50 en Artikel 53 (1) (a) & (g) en 53 (5) van die Mangaung Metro Munisipaliteit Munisipale Grondgebruik Beplanning Bywette (2021) dat 'n aansoek ingedien is vir die wysiging van die sonering "Spesiale Gebruik Cxxviii" - doeleindes waarvoor grond gebruik mag word (toelaatbare gebruike): Winkelsentrum, die onwikkeling wat beperk is tot 'n totale maksimum Bruto Verhuurbare Oppervlakte (BVO) van 42 628m2, waarvan die volgende net van toepassing is op erf 40501 naamlik kleinhandel, kantore en restaurant(e) wat nie 9 039m2 BVO sal oorskry nie / studente behuising beperk tot 1 065 studente/beddens / gimnasium wat nie 2 237m2 BVO sal oorskry nie / diensstasie wat beperk word tot 'n maksimum BVO van 168m2. Die perseel is geleë op die hoek van Nelson Mandela Rylaan en Generaal Dan Pienaar Rylaan (131 Kellner Straat) asook hoek van Stapelberg Straat en Melville Rylaan (20 Stapelberg Straat), Brandwag, Bloemfontein.

Notice is given in terms of:

• Regulation 41(2)(b) of the Environmental Impact Assessment Regulations of 2017, No. 326 published in Government Notice No. 40772 under the National Environmental Management Act, 1998 (Act No. 107 of 1998) that an application for environmental authorization will be submitted to the Free State Department of Economic Development, Small Businesses, Tourism and Environmental Affairs (DESTEA); and
•Regulation 17(3)(c) of the Regulations Regarding The Procedural Requirements for Water Use License Applications and Appeals of 2017 No. R. 267 published in Government Notice No. 40713 of 24 March 2017 under the National Water Act (Act 36 of 1998) Section 21 as amended, that an application for a Water Use License will be submitted to the Department of Water and Sanitation (DWS);
for the following:
Project: Proposed construction of a water abstraction works and associated infrastructures as part of the Senekal Bulk Water Supply System.
Locality: Remainder and Portion 4 of the farm Zyfer Fontein 246, Senekal.
Proponent: Setsoto Local Municipality.
If you have any information or comments regarding the environmental impact of the proposed development or need additional information regarding the proposed development, please submit your name, contact information and interest to Hanlie Stander at the MDA hanlie@mdagroup.co.za
Tel: 051 447 1583 /
Fax: 051 448 9838 /
P.O. Box 100982, Brandhof, Bloemfontein, 9324) within 30 days of this notice.

VERLORE DOKUMENTE
4040

McINTYRE VAN DER POST LAW FIRM

Notice is hereby given in terms of Regulation 68 of the Deeds Registries Act, 1937, of the intention to apply for the issue of a certified copy of
Certificate of Real Right of Exclusive Use Area
SK555/2001 passed by Ronald Norman Laing, Identity Number 511112 5033 08 4, Married out of community of property, in respect of certain Exclusive Use Area described as TUIN no T2 as shown and more fully described on Sectional Plan No SS 69/2001 in the scheme known as LEVISEUR PLACE in respect of the land and building or buildings situated at BLOEMFONTEIN, MANGAUNG METROPOLITAN MUNICIPALITY, which has been lost or destroyed.
All interested persons having objection to the issue of such copy are hereby required to lodge the same in writing with the Registrar of Deeds at BLOEMFONTEIN within two weeks from the date of the publication of this notice.
Dated at BLOEMFONTEIN this 11th day of NOVEMBER 2021.
MCINTYRE VAN DER POST INC – LIEZL VAN ZYL
Address: 12 BARNES STREET, WESTDENE, BLOEMFONTEIN
E -mail address: liezl@mcintyre.co.za
Contact number: 051 505 0200

McINTYRE VAN DER POST LAW FIRM

Notice is hereby given in terms of Regulation 68 of the Deeds Registries Act, 1937, of the intention to apply for the issue of a certified copy of
Certificate of Real Right of Exclusive Use Area
SK555/2001 passed by Ronald Norman Laing, Identity Number 511112 5033 08 4, Married out of community of property, in respect of certain Exclusive Use Area described as TUIN no T2 as shown and more fully described on Sectional Plan No SS 69/2001 in the scheme known as LEVISEUR PLACE in respect of the land and building or buildings situated at BLOEMFONTEIN, MANGAUNG METROPOLITAN MUNICIPALITY, which has been lost or destroyed.
All interested persons having objection to the issue of such copy are hereby required to lodge the same in writing with the Registrar of Deeds at BLOEMFONTEIN within two weeks from the date of the publication of this notice.
Dated at BLOEMFONTEIN this 11th day of NOVEMBER 2021.
MCINTYRE VAN DER POST INC – LIEZL VAN ZYL
Address: 12 BARNES STREET, WESTDENE, BLOEMFONTEIN
E -mail address: liezl@mcintyre.co.za
Contact number: 051 505 0200

McINTYRE VAN DER POST LAW FIRM

Notice is hereby given in terms of Regulation 68 of the Deeds Registries Act, 1937, of the intention to apply for the issue of a certified copy of
Certificate of Real Right of Exclusive Use Area
SK555/2001 passed by Ronald Norman Laing, Identity Number 511112 5033 08 4, Married out of community of property, in respect of certain Exclusive Use Area described as TUIN no T2 as shown and more fully described on Sectional Plan No SS 69/2001 in the scheme known as LEVISEUR PLACE in respect of the land and building or buildings situated at BLOEMFONTEIN, MANGAUNG METROPOLITAN MUNICIPALITY, which has been lost or destroyed.
All interested persons having objection to the issue of such copy are hereby required to lodge the same in writing with the Registrar of Deeds at BLOEMFONTEIN within two weeks from the date of the publication of this notice.
Dated at BLOEMFONTEIN this 21st day of FEBRUARY 2022.
CLAUDE REID INC., Applicant, 165 St Andrew Street, Bloemfontein 9310. Email: dalize@claudereid.co.za, Tel. 051 447 9881.

McINTYRE VAN DER POST LAW FIRM

Notice is hereby given in terms of Regulation 68 of the Deeds Registries Act, 1937, of the intention to apply for the issue of a certified copy of
Certificate of Registered Title ST28956/2001 passed by Ronald Norman Laing, Identity Number 511112 5033 08 4, Married out of community of property, in respect of certain Unit consisting of Section No. 2 as shown and more fully described on Sectional Plan No SS 69/2001 in the scheme known as LEVISEUR PLACE in respect of the land and building or buildings situated at BLOEMFONTEIN, MANGAUNG METROPOLITAN MUNICIPALITY, which has been lost or destroyed.
All interested persons having objection to the issue of such copy are hereby required to lodge the same in writing with the Registrar of Deeds at BLOEMFONTEIN within two weeks from the date of the publication of this notice.
Dated at BLOEMFONTEIN this 11th day of NOVEMBER 2021.
MCINTYRE VAN DER POST INC – LIEZL VAN ZYL
Address: 12 BARNES STREET, WESTDENE, BLOEMFONTEIN
E -mail address: liezl@mcintyre.co.za
Contact number: 051 505 0200

Claude Reid
ST6432/2020

Notice is hereby given in terms of Regulation 68 of the Deeds Registries Act, 47/-1937 of the intention to apply for the issue of a certified copy of Deed of Transfer ST6432/2020 passed by IZAK BARNARD, ID-no. 740102 5003 08 1 and GERTRUIDA SOPHIA BARNARD, ID-no. 730215 0091 08 3 in favour of ALETTA META RAWLINSON, ID-no. 611215 0021 08 4 in respect of certain:- A unit consisting of Section-no. 2 as shown and more fully described on Sectional Plan-no. SS411/2007 in the scheme known as Piet Krugerstraat 35 in respect of the land and building or buildings situated at Bloemfontein (Extension 124) Mangaung Metropolitan Municipality, of which section the floor area according to the said sectional plan is 94 (ninety four) square metres in extent which has been lost or destroyed.
All interested persons having objection to the issue of such copy are hereby required to lodge the same in writing with the Registrar of Deeds at Bloemfontein within two weeks from the date of the publication of this notice.
Dated at Bloemfontien on this 21st day of February 2022.
CLAUDE REID INC., Applicant, 165 St Andrew Street, Bloemfontein 9310. Email: dalize@claudereid.co.za, Tel. 051 447 9881.

MAREE & VENNOTE PROKUREURS/ ATTORNEYS

LOST OR DESTROYED DEED

Notice is hereby given in terms of Regulation 68 of the Deeds Registries Act, 1937, of the intention to apply for the issue of a certified copy of Deed of Transfer Number T 17600/2011 passed by Molefi Everd Monaheng (Identity Number 761026 5290 089) and Sophia Elsie Kediemetse Monaheng (Identity Number 790117 0318 08 5), Married in community of property to each other in favour of Sebong Vincent Matobako, Identity Number 641219 5422 08 5), Unmarried in respect of certain Erf 27616 Mangaung Extension 18, district Bloemfontein, Province Free State which has been lost or destroyed.
All person having objection to the issue of such copy are hereby required to lodge the same in writing with the Registrar of Deeds at Bloemfontein within two weeks after the date of the publication of this notice.
DATED at BLOEMFONTEIN this the 3rd day of FEBRUARY 2022
Applicant : Maree & Partners Attorneys (A H Taute)
Address : P O Box 3293, Bloemfontein, 9300
Email address : anton@mareeprok.co.za
Contact number : 051-447 8648

T45339/2000 LOST OR DESTROYED DEED OF TRANSFER

Notice is hereby given in terms of Regulation 68 of the Deeds Registries Act, 1937, of the intention to apply for the issue of a certified copy of Deed of Transfer T45339/2000 passed by THE BLOEMFONTEIN TRANSITIONAL LOCAL COUNCIL in favour of COLIZELE PETRUS QEKU, ID-no. 470526 5359 08 3, unmarried in respect of certain: Erf 10051 Mangaung Extension 20, District Bloemfontein, Province Free State, in extent 306 (three hundred and six) square metres which has been lost or destroyed.
All interested persons having objections to the issue of such copy are hereby required to lodge the same in writing with the Registrar of Deeds at Bloemfontein within two weeks from the date of the publication of this notice.
Dated at Bloemfontein this 9th day of February 2022.
PEPYER ATTORNEYS, Madalane Peyper, 101 Olympus Avenue, Helicon Heights, Bloemfontein. Email: amelia@peyperattorneys.co.za. Tel. 051 444 2256. Ref: MT0030.

AANDAG
ALLE ADVERTEERDERS
Die gebruik van die letter "A", leestekens soos "!"of "*"of die gebruik van syfers met die doel om die advertensie na die bopunt van die klassifikasie-lys te skuif, is streng verbode.
SMALLS NOTICE

Claude Reid
T6542/2002

Notice is hereby given in terms of Regulation 68 of the Deeds Registries Act, 47/-1937, of the intention to apply for the issue of a certified copy of Deed of Transfer T6542/2002 passed by DALLINA MARTHINA JACOBA MAREE in favour of BEGINSELSDAM BOERDERY BK in respect of: 1. Remainder of the Farm Beginseldam A 811, District Boshof, Province Free State; 2. Portion 3 of the Farm Clifton 706, District Boshof, Province Free State; which has been lost or destroyed.
All interested persons having objections to the issue of such copy are hereby required to lodge the same in writing with the Registrar of Deeds at Bloemfontein, Nelson Mandela Street, Bloemfontein within two (2) weeks from the date of the publication of this notice.
Dated at Bloemfontien on this 15th day of February 2022.
CLAUDE REID INC., Johann Marx De Villiers, Applicant, 165 St Andrew Street, Bloemfontein. Tel. 051 447 9881. Email: heleen@claudereid.co.za. Ref: WB7501.

BOEDELKENNISGEWINGS

BOEDELS: KREDITEURE EN DEBITEURE
4201

SPANGENBERG ZIETSMAN BLOEM
Attorneys • Notaries • Conveyancers

A. Marais

All persons having claims against the under-mentioned estate must lodge it with the Executor concerned within 30 days (or as indicated) from date of publication hereof.
Late estate ANDRE MARAIS, ID-no. 480817 5170 08 5, date of birth 1948/08/17, date of death 2020/08/12 of 9 Rietkool Street, Pellissier, Bloemfontein. Province of the Master's Office Free State and Master's Office Bloemfontein. Estate-no. 007595/2020.
SPANGENBERG ZIETSMAN & BLOEM, Executor of Authorised Agent, 6 Seventh Street, Arboretum, Bloemfontein. Tel. 051 409 5001.

Claude Reid
A.J. Dannhauser

In the estate of the late ANNA JOHANNA DANNHAUSER, ID-no. 481121 0045 08 0, date of death 21/01/-2022 of House Cecilia-no. 6, Noordebloem, Metz Street, Bloemfontein 9301. Estate-no. 1606/2022.
All persons having claims against the above-mentioned estate are required to lodge their claims with the undersigned within 30 days after the date of publication hereof.
JOHAN HELGARD VAN SCHALKWYK, Executor or Authorised Estate, 165 St Andrew Street, Bloemfontein 9301. Tel. 051 447 9881.

BEUKES & BEUKES

C.J. VAN WYK
KENNISGEWING

In die boedel van wyle CHRISTIAAN JOHANNES VAN WYK
IDENTITEITSNOMMER 310323 5021 08 5
EN NAGELATE EGGENOTE ELIZABETH MARIA VAN WYK
IDENTITEITSNOMMER 380424 0034 08 4
BOEDELNOMMER : 000803/2022
in lewe van Bredenkampstraat , BULTFONTEIN, 9670
Kennis geskied hiermee aan Krediteure in bogemelde boedel om hul eise by ondergemelde adres in te lewer binne 'n tydperk van 30 (DERTIG) dae vanaf publikasie hiervan.

BEUKES & BEUKES
Prokureurs vir Eksekuteur
President Swartstraat 58
Posbus 15
BULTFONTEIN
9670
Tel. Nr. 051 – 8531110

MAREE & VENNOTE PROKUREURS/ ATTORNEYS

D.A. DIEDERICKS
KENNISGEWING

In die boedel van wyle DANIEL ANDRIES DIEDERICKS (Identiteitsnommer: 730404 5111 08 4), in lewe getroud buite gemeenskap van goed (met toepassing van die aanwasbedeling) en woonagtig te Walter Sisulustraat 76, Wilgehof, Bloemfontein (Boedelnommer : 10124/2021) wat oorlede is op 9 Oktober 2021.

Krediteure en debiteure word hiermee versoek om hulle eise in te dien en hulle skulde te betaal binne 'n tydperk van 30 (DERTIG) dae gereken van datum van verskyning van hierdie advertensie af.

EKSEKUTEUR
p/a MAREE & VENNOTE
POSBUS 3293
9300 BLOEMFONTEIN

Example of Notification to Adjacent Landowners:

PUBLIC PARTICIPATION PROCESS:
Basic Assessment Process &
Application to Department of Water and Sanitation

Date: 25 February 2022

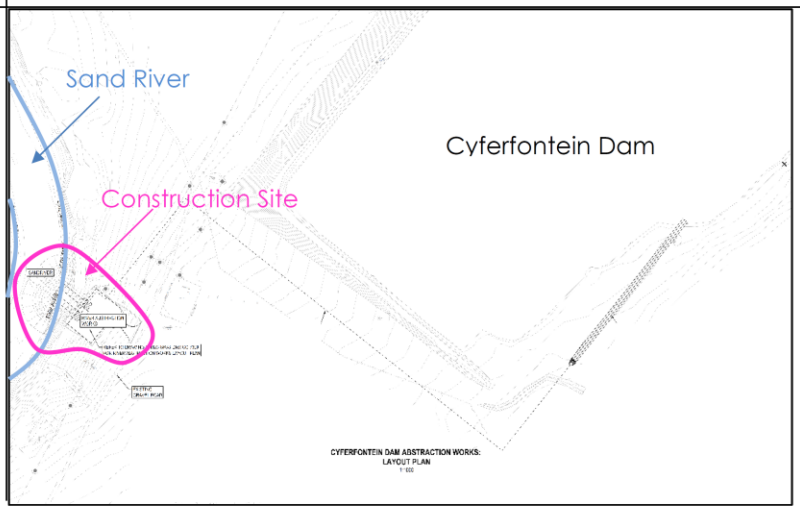
Notice is given in terms of:

- Regulation 41(2)(b) of the Environmental Impact Assessment Regulations of 2017, No. 326 published in Government Notice No. 40772 under the National Environmental Management Act, 1998 (Act No. 107 of 1998) that an application for environmental authorization will be submitted to the Free State Department of Economic Development, Small Businesses, Tourism and Environmental Affairs (DESTEA); and
- Regulation 17(3)(c) of the Regulations Regarding The Procedural Requirements for Water Use License Applications and Appeals of 2017 No. R. 267 published in Government Notice No. 40713 of 24 March 2017 under the National Water Act (Act 36 of 1998) Section 21 as amended, that an application for a Water Use License will be submitted to the Department of Water and Sanitation (DWS);

For the following:

Project:	Proposed construction of a water abstraction works and associated infrastructures as part of the Senekal Bulk Water Supply System.
Locality:	Remainder and Portion 4 of the farm Zyfer Fontein 246, Senekal. Please refer to attached drawing.
Proponent:	Setsoto Local Municipality

If you have any information or comments regarding the environmental impact of the proposed development or need additional information regarding the proposed development, please submit your name, contact information and interest to Hanlie Stander at the following consultants **within 30 days** of this notice.

Environmental Consultants:	**Indication of position of proposed construction activities**
mda P.O. Box 100982 Brandhof Bloemfontein 9324 **Tel:** 051 447 1583 **Fax:** 051 448 1839 **Contact person:** Hanlie Stander hanlie@mdagroup.co.za	

Notification to Adjacent Landowners:

Hanlie Sander

From: Hanlie Sander <hanlie@mdagroup.co.za>
Sent: Friday, 25 February 2022 10:57
To: 'sinclairlouise31@gmail.com'
Subject: Cyferfontein Abstraction Works
Attachments: Cyferfontein Abstraction Map.jpg; Pamphlets 2022.02.25.pdf

Mr Heyns,

- The Ficksburg Abattoir Trust is the owner of the Remainder of the farm Uitkomst 513, Senekal.

1. The property mentioned above lies adjacent to the following properties:
   - The remainder of the farm Zyfer Fontein 246, Senekal
   - Portion 4 of the farm Zyfer Fontein 246, Senekal

2. MDA was appointed to submit an application for Environmental Authorisation for the proposed construction of an Abstraction Works on the above-mentioned properties. You are therefore identified as Possible Interested and / or Affected Party, thus the reason for this e-mail.

3. It will be appreciated if you could read through the attached PDF.

4. If you have any information or comments regarding the environmental impact of the proposed development or need additional information regarding the proposed development, please submit your name, contact information and interest to us within 30 days of this notice.

Trust that you will find the above in order.

Please do not hesitate to contact us should you require additional information on the above.

Kind regards,

Hanlie Stander

Registered Environmental Assessment Practitioner: Number 2019/1997

mda Town & Regional Planners, Environmental & Development Consultants

9 Barnes Street | Westdene | Bloemfontein | 9301
P.O. Box 100982 | Brandhof | 9324
Tel: 051 447 1583 | Fax: 051 448 9839

Hanlie Sander

From: Hanlie Sander <hanlie@mdagroup.co.za>
Sent: Friday, 25 February 2022 10:43
To: 'jdheyns@enslins.com'
Subject: Cyferfontein Abstraction Works
Attachments: Pamphlets 2022.02.25.pdf; Cyferfontein Abstraction Map.jpg

Mr Heyns,

1. The Department of Justice and Constitutional Development confirmed that you are authorised to act as a trustee for the following trusts:
    - WJ Storm Trust
    - Jan Heyns Trust
    - Jan du Preez Trust

2. The three Trusts mentioned above lies adjacent to either one of the following properties:
    - The remainder of the farm Zyfer Fontein 246, Senekal
    - Portion 4 of the farm Zyfer Fontein 246, Senekal

3. MDA was appointed to submit an application for Environmental Authorisation for the proposed construction of an Abstraction Works on the above-mentioned properties. As the above-mentioned Trusts own properties adjacent to the said farms, the Trusts were identified as Possible Interested and / or Affected Parties, thus the reason for this e-mail.

4. It will be appreciated if you could read through the attached PDF.

5. If you have any information or comments regarding the environmental impact of the proposed development or need additional information regarding the proposed development, please submit your name, contact information and interest to us within 30 days of this notice.

Trust that you will find the above in order.

Please do not hesitate to contact us should you require additional information on the above.

Kind regards,

Hanlie Stander

Registered Environmental Assessment Practitioner: Number 2019/1997

Notification and feedback from the landowner, where the landowner is not the applicant:

Hanlie Stander

From: Rowlen Ryan <Rowlen.Ryan@dalrrd.gov.za>
Sent: Monday, 27 June 2022 11:19
To: Ernest Horn
Cc: Mandisa Sitsila; admin1@oelofse.co.za; 'Admin3'; ilanie@oelofse.co.za; Hanlie Stander
Subject: RE: 41032: Senekal Water Project: Cyferfontein Abstraction
Attachments: DOC.pdf

Dear Mr Horn

Apology for the late response. Please find hereto attached a copy of the consent granted for your attention.

Kind regards

Rowlen

From: Ernest Horn <Ernest.Horn@zutari.com>
Sent: Wednesday, 01 June 2022 16:14
To: Rowlen Ryan <Rowlen.Ryan@dalrrd.gov.za>
Cc: Mandisa Sitsila <Mandisa.Sitsila@dalrrd.gov.za>; admin1@oelofse.co.za; 'Admin3' <admin3@oelofse.co.za>; ilanie@oelofse.co.za; Hanlie Stander <hanlie@mdagroup.co.za>
Subject: RE: 41032: Senekal Water Project: Cyferfontein Abstraction

Good Day Mr. Rowlen.

As discussed, please find attached to this e-mail the letter giving a clear scope, exact location property boundaries etc. of the proposed works to be done on the remainder of farm Zyfer Fontein No. 246 and as discussed in the trailing e-mails.

I trust you find the attached in order.

Please let me know if anything is unclear.

Kind Regards

Ernest Horn
SENIOR TECHNOLOGIST | ZUTARI

M +27 73 192 4004 **E** Ernest.Horn@zutari.com **W** zutari.com

---

From: Rowlen Ryan <Rowlen.Ryan@dalrrd.gov.za>
Sent: Tuesday, 31 May 2022 13:07
To: Ernest Horn <Ernest.Horn@zutari.com>
Cc: Mandisa Sitsila <Mandisa.Sitsila@dalrrd.gov.za>; admin1@oelofse.co.za; 'Admin3' <admin3@oelofse.co.za>; ilanie@oelofse.co.za; Hanlie Stander <hanlie@mdagroup.co.za>
Subject: RE: 41032: Senekal Water Project: Cyferfontein Abstraction

Dear Mr Horn

It is trusted that you are doing well.

May you kindly confirm when the letter will be ready.

Kind regards

Rowlen

From: Rowlen Ryan
Sent: Thursday, 26 May 2022 14:24
To: 'Ernest Horn' <Ernest.Horn@zutari.com>
Cc: Mandisa Sitsila <Mandisa.Sitsila@dalrrd.gov.za>; Eric DuToit <Eric.DuToit@dalrrd.gov.za>; Eric DuToit <Eric.DuToit@dalrrd.gov.za>; admin1@oelofse.co.za; 'Admin3' <admin3@oelofse.co.za>; ilanie@oelofse.co.za; Hanlie Stander <hanlie@mdagroup.co.za>
Subject: RE: 41032: Senekal Water Project: Cyferfontein Abstraction

Thank you Mr Horn. I will then wait for your letter.

Kind regards

Rowlen

From: Ernest Horn <Ernest.Horn@zutari.com>
Sent: Thursday, 26 May 2022 14:23
To: Rowlen Ryan <Rowlen.Ryan@dalrrd.gov.za>
Cc: Mandisa Sitsila <Mandisa.Sitsila@dalrrd.gov.za>; Eric DuToit <Eric.DuToit@dalrrd.gov.za>; Eric DuToit <Eric.DuToit@dalrrd.gov.za>; admin1@oelofse.co.za; 'Admin3' <admin3@oelofse.co.za>; ilanie@oelofse.co.za; Hanlie Stander <hanlie@mdagroup.co.za>
Subject: RE: 41032: Senekal Water Project: Cyferfontein Abstraction

Good day Mr Rowlen,

Thanks for the feedback.

I can definitely write you a letter explaining exactly what will happen on the remainder and within the servitude. When construction is finished most of the structure will actually stand within the river or right on the bank of the river, hence my previous comment that your intended use for the land will most definitely not be affected.

I will also attach our design drawings to the letter explaining the exact intended works to be constructed by the Municipality.

I will send you this information in the meantime, but I am still available to have a quick meeting just to explain the extent of the works in person if required.

I trust you find the above-mentioned in order.

Kind Regards

Ernest Horn

SENIOR TECHNOLOGIST | ZUTARI

M +27 73 192 4004 **E** Ernest.Horn@zutari.com **W** zutari.com

From: Rowlen Ryan <Rowlen.Ryan@dalrrd.gov.za>
Sent: Thursday, 26 May 2022 13:01
To: Ernest Horn <Ernest.Horn@zutari.com>
Cc: Mandisa Sitsila <Mandisa.Sitsila@dalrrd.gov.za>; Eric DuToit <Eric.DuToit@dalrrd.gov.za>; Eric DuToit <Eric.DuToit@dalrrd.gov.za>; admin1@oelofse.co.za; 'Admin3' <admin3@oelofse.co.za>; ilanie@oelofse.co.za; Hanlie Stander <hanlie@mdagroup.co.za>
Subject: RE: 41032: Senekal Water Project: Cyferfontein Abstraction

Dear Mr Horn

Apology for my late response.

The contents of your email is dually noted. Unfortunately I am already committed during the week of the 30th May to 3 June. The only dated I have presently is the 6th June. I have already compiled a draft memo to request our ACD to sign the consent. However, I am not sure what will be done on our land. Is there a possibility that you can forward me an email/letter to indicate what the municipality intends to do on the Remainder. This email/letter can be used as POE attached to my memorandum.

Kind regards

Rowlen

From: Ernest Horn <Ernest.Horn@zutari.com>
Sent: Wednesday, 25 May 2022 12:02
To: Rowlen Ryan <Rowlen.Ryan@dalrrd.gov.za>
Cc: Mandisa Sitsila <Mandisa.Sitsila@dalrrd.gov.za>; Eric DuToit <Eric.DuToit@dalrrd.gov.za>; Eric DuToit <Eric.DuToit@dalrrd.gov.za>; admin1@oelofse.co.za; 'Admin3' <admin3@oelofse.co.za>; ilanie@oelofse.co.za; Hanlie Stander <hanlie@mdagroup.co.za>
Subject: RE: 41032: Senekal Water Project: Cyferfontein Abstraction

Good Day Mr. Rowlen,

With reference to the trailing e-mails and subject matter regarding the construction of the proposed Cyferfontein Abstraction works.

Can we please propose a meeting with yourself, myself and Mrs. Stander in order to explain and discuss this matter? It will become evident during this discussion that the extent of the works is in actual fact very small and only affects one small corner of the property/servitude right next to the river. The abstraction works will not affect the actual land use when completed.

It would be beneficial to the process going forward to explain the technical aspects (of the proposed abstraction) as well as the required documentation (as sent by Mrs. Stander in the e0mail below) to finalise the public participation process. This discussion will give you more information and background on the project.

Please indicate a suitable date for such a meeting.

We trust you find the above mentioned in order.

Kind Regards

Ernest Horn
SENIOR TECHNOLOGIST | ZUTARI

From: Hanlie Stander <hanlie@mdagroup.co.za>
Sent: Thursday, 12 May 2022 15:56
To: Ernest Horn <Ernest.Horn@zutari.com>
Cc: 'Mandisa Sitsila' <Mandisa.Sitsila@dalrrd.gov.za>; 'Eric DuToit' <Eric.DuToit@dalrrd.gov.za>; 'Eric DuToit' <Eric.DuToit@dalrrd.gov.za>; 'Rowlen Ryan' <Rowlen.Ryan@dalrrd.gov.za>; admin1@oelofse.co.za; 'Admin3' <admin3@oelofse.co.za>; hanlie@mdagroup.co.za; ilanie@oelofse.co.za
Subject: 41032: Senekal Water Project: Cyferfontein Abstraction

Good day,

With reference to the above-mentioned project, the following:

1. As part of the Environmental Authorisation Application Process, the landowner (if not a natural person, as in this case) should also sign a consent form. An example is provided – please copy the letter onto the Letter Head of the relevant Department.

2. Information on the servitude is also provided, as well as Maps indicating the extent of the activities associated with the proposed construction of the proposed new Abstraction Facility.

3. It will be appreciated if DALRRD can sign the relevant documentation. The original signed document will then be collected, as soon as it is available.

Your assistance is valued.

Please do not hesitate to contact us should you require additional information on the above.

Kind regards,

Hanlie Stander

Registered Environmental Assessment Practitioner: Number 2019/1997

mda Town & Regional Planners, Environmental & Development Consultants

9 Barnes Street | Westdene | Bloemfontein | 9301
P.O. Box 100982 | Brandhof | 9324
Tel: 051 447 1583 | Fax: 051 448 9839

From: Ernest Horn <Ernest.Horn@zutari.com>
Sent: Wednesday, 11 May 2022 09:52
To: Hanlie Stander <hanlie@mdagroup.co.za>
Cc: Mandisa Sitsila <Mandisa.Sitsila@dalrrd.gov.za>; Eric DuToit <Eric.DuToit@dalrrd.gov.za>; Eric DuToit <Eric.DuToit@dalrrd.gov.za>; Rowlen Ryan <Rowlen.Ryan@dalrrd.gov.za>; admin1@oelofse.co.za; 'Admin3'

<admin3@oelofse.co.za>; hanlie@mdagroup.co.za; ilanie@oelofse.co.za
Subject: RE: Senekal Water Project: Cyferfontein Abstraction - Portion 4 of the farm Zyfer Fontein

Good Day Hanlie,

With reference to the trailing e-mails, please send all the required information to the Department.

Thank you

Kind Regards

Ernest Horn
SENIOR TECHNOLOGIST | ZUTARI

M +27 73 192 4004 **E** Ernest.Horn@zutari.com **W** zutari.com

---

From: Rowlen Ryan <Rowlen.Ryan@dalrrd.gov.za>
Sent: Wednesday, 11 May 2022 09:44
To: admin1@oelofse.co.za; 'Admin3' <admin3@oelofse.co.za>; Ernest Horn <Ernest.Horn@zutari.com>; hanlie@mdagroup.co.za; ilanie@oelofse.co.za
Cc: Mandisa Sitsila <Mandisa.Sitsila@dalrrd.gov.za>; Eric DuToit <Eric.DuToit@dalrrd.gov.za>; Eric DuToit <Eric.DuToit@dalrrd.gov.za>
Subject: RE: Senekal Water Project: Cyferfontein Abstraction - Portion 4 of the farm Zyfer Fontein

Good morning

Due to inaccurate deeds office information the Department is hereby withdrawing its letter dated 9 May 2022 in respect of the Remaining Extent of the farm Zyfer Fontein 246.

In order to address your enquire over the Remaining Extent, may you kindly forward all the relevant documentation related to the registered servitude to this office. Please include the Servitude Diagram and location map.

Kind regards

Rowlen

From: Rowlen Ryan
Sent: Tuesday, 10 May 2022 13:53
To: 'admin1@oelofse.co.za' <admin1@oelofse.co.za>; 'Admin3' <admin3@oelofse.co.za>; 'Ernest Horn' <Ernest.Horn@zutari.com>; 'hanlie@mdagroup.co.za' <hanlie@mdagroup.co.za>; 'ilanie@oelofse.co.za' <ilanie@oelofse.co.za>
Cc: Mandisa Sitsila <Mandisa.Sitsila@dalrrd.gov.za>; Eric DuToit <Eric.DuToit@dalrrd.gov.za>; Eric DuToit <Eric.DuToit@dalrrd.gov.za>
Subject: RE: Senekal Water Project: Cyferfontein Abstraction - Portion 4 of the farm Zyfer Fontein

Good afternoon

Please find hereto attached a response letter related to the above-mentioned matter for your attention.

It is trusted that you will find this matter in order.

Kind regards

Rowlen

From: Rowlen Ryan
Sent: Wednesday, 04 May 2022 08:24
To: Eric DuToit <Eric.DuToit@dalrrd.gov.za>; Eric DuToit <Eric.DuToit@dalrrd.gov.za>
Cc: admin1@oelofse.co.za; 'Admin3' <admin3@oelofse.co.za>; 'Ernest Horn' <Ernest.Horn@zutari.com>; 'ilanie@oelofse.co.za' <ilanie@oelofse.co.za>; hanlie@mdagroup.co.za; Mandisa Sitsila <Mandisa.Sitsila@dalrrd.gov.za>
Subject: RE: Senekal Water Project: Cyferfontein Abstraction - Portion 4 of the farm Zyfer Fontein

Good morning Mr Du Toit and colleagues

I have scrutinise the attached documents. We as the owners of Portion 1 of the farm Zyfer Fontein No. 246 needs to indicate whether we have any objection to the water abstraction development on Portion 4 of the farm which is according to the Deeds Info not State land which implies that I do not have any objection to the application on condition that approval must be granted by the title holders and other State organs. A letter will be forwarded shortly.

Kind regards

Rowlen

From: ilanie@oelofse.co.za <ilanie@oelofse.co.za>
Sent: Monday, 04 April 2022 16:26
To: 'Ernest Horn' <Ernest.Horn@zutari.com>; hanlie@mdagroup.co.za; Eric DuToit <Eric.DuToit@dalrrd.gov.za>; Eric DuToit <Eric.DuToit@dalrrd.gov.za>
Cc: admin1@oelofse.co.za; 'Admin3' <admin3@oelofse.co.za>
Subject: FW: Senekal Water Project: Cyferfontein Abstraction - Portion 4 of the farm Zyfer Fontein
Importance: High

Good afternoon Eric

Kindly take note of the below e-mail and attachments thereto

Kind regards

Ilanie Oberholzer
Prokureur / Attorney
N O OELOFSE INGELYF
Sel: 083 414 3038
Tel : 058 481 2291
Van Riebeeckstraat 28
Posbus 51
SENEKAL
9600

From: Ernest Horn <Ernest.Horn@zutari.com>
Sent: Monday, April 4, 2022 3:44 PM
To: ilanie@oelofse.co.za
Cc: Hanlie Sander <hanlie@mdagroup.co.za>
Subject: Senekal Water Project: Cyferfontein Abstraction - Portion 4 of the farm Zyfer Fontein

Hi Ilanie,

Trust you are well.

With reference to our telephonic discussion end of last week with regards to the construction of the Cyferfontein/Sand River Abstraction works as well as the selling of your late Father's farm.

Please find attached to this e-mail some documentation pertaining to the public participation (same as the posters currently put up on site), the registered servitude and deed to the property. Also attached is a standard consent form written by the Environmental Agent handling the public participation on the project. The new owner of the property must be made aware of this information as part of the public participation process and must also sign the consent form to acknowledge that they are aware of the planned construction works. As mentioned, all construction activities will be done on the registered servitude.

Would you please be able to send this information on to the new owner as you still have frequent communication and a good relationship with them pertaining to the selling of the property. The pdf documents are just for information purposes, while the word document must be transferred to the new owner's letter head and must be signed accordingly and furnished back to us.

Alternatively, you can also supply us with the new owner's information in order for the Environmental Agent to pursue them directly.

The process and finalisation of this process is quite urgent as we do not want this process to delay construction. The Setsoto Local Municipality is currently busy with the appointment of the Contractor.

Your assistance in this regard will be greatly appreciated.

Kind Regards

Ernest Horn
SENIOR TECHNOLOGIST | ZUTARI

M +27 73 192 4004 **E** Ernest.Horn@zutari.com **W** zutari.com

From: Hanlie Sander <hanlie@mdagroup.co.za>
Sent: Monday, 04 April 2022 14:54
To: Ernest Horn <Ernest.Horn@zutari.com>
Subject: 41032: Cyferfontein Abstraction - Portion 4 of the farm Zyfer Fontein

Ernest,

During our telephonic conversation last week, you've mentioned that the Remainder of the farm Zyfer Fontein 246 was sold.

It will be appreciated if you could provide us with the contact information of the new landowner.

Alternatively, please provide a copy of the 'Pamphlets 2022.02.25pdf' to the new landowner. The landowner should also complete and sign the attached WORD document (preferably on their own letter head).

Proof of notification as well as the consent letter is required before MDA can submit the Application Document.

Trust that you will find the above in order.

Please do not hesitate to contact us should you require additional information on the said project.

Kind regards,

Hanlie Stander

Registered Environmental Assessment Practitioner: Number 2019/1997

mda Town & Regional Planners, Environmental & Development Consultants

9 Barnes Street | Westdene | Bloemfontein | 9301
P.O. Box 100982 | Brandhof | 9324
Tel: 051 447 1583 | Fax: 051 448 9839

From: Hanlie Sander <hanlie@mdagroup.co.za>
Sent: Friday, 25 March 2022 11:13
To: Ernest Horn (Ernest.Horn@zutari.com) <Ernest.Horn@zutari.com>
Subject: 41032: Cyferfontein Abstraction - Portion 4 of the farm Zyfer Fontein

Ernest,

With reference to the e-mail below, please indicate if Ms Cilliers signed the document.

Kind regards,

Hanlie Stander

Registered Environmental Assessment Practitioner: Number 2019/1997

mda Town & Regional Planners, Environmental & Development Consultants

9 Barnes Street | Westdene | Bloemfontein | 9301
P.O. Box 100982 | Brandhof | 9324
Tel: 051 447 1583 | Fax: 051 448 9839

From: Hanlie Sander <hanlie@mdagroup.co.za>
Sent: Friday, 25 February 2022 10:22
To: Ernest Horn (Ernest.Horn@zutari.com) <Ernest.Horn@zutari.com>
Subject: Cyferfontein Abstraction - Portion 4 of the farm Zyfer Fontein

Ernest,

With reference to our telephonic conversation, the following:

1. Attached hereto is a copy of the Deed's Document, as well as the Notarial Deed and the S.G. Diagram indicating the servitude area.

2. The document to be completed by Ms Cilliers is also attached hereto.

Trust that you will find the above in order.

Please do not hesitate to contact us should you require additional information on the above.

Kind regards,

Hanlie Stander

Registered Environmental Assessment Practitioner: Number 2019/1997

mda Town & Regional Planners, Environmental & Development Consultants

9 Barnes Street | Westdene | Bloemfontein | 9301
P.O. Box 100982 | Brandhof | 9324
Tel: 051 447 1583 | Fax: 051 448 9839

From: Ernest Horn <Ernest.Horn@zutari.com>
Sent: Thursday, 24 February 2022 13:46
To: Hanlie Sander <hanlie@mdagroup.co.za>
Cc: neil@mdagroup.co.za
Subject: RE: Cyferfontein Abstraction - Portion 4 of the farm Zyfer Fontein

Noted

Ernest Horn

SENIOR TECHNOLOGIST | ZUTARI

M +27 73 192 4004 **E** Ernest.Horn@zutari.com **W** zutari.com

From: Hanlie Sander <hanlie@mdagroup.co.za>
Sent: Thursday, 24 February 2022 13:31
To: Ernest Horn <Ernest.Horn@zutari.com>
Cc: neil@mdagroup.co.za
Subject: Cyferfontein Abstraction - Portion 4 of the farm Zyfer Fontein

Ernest,

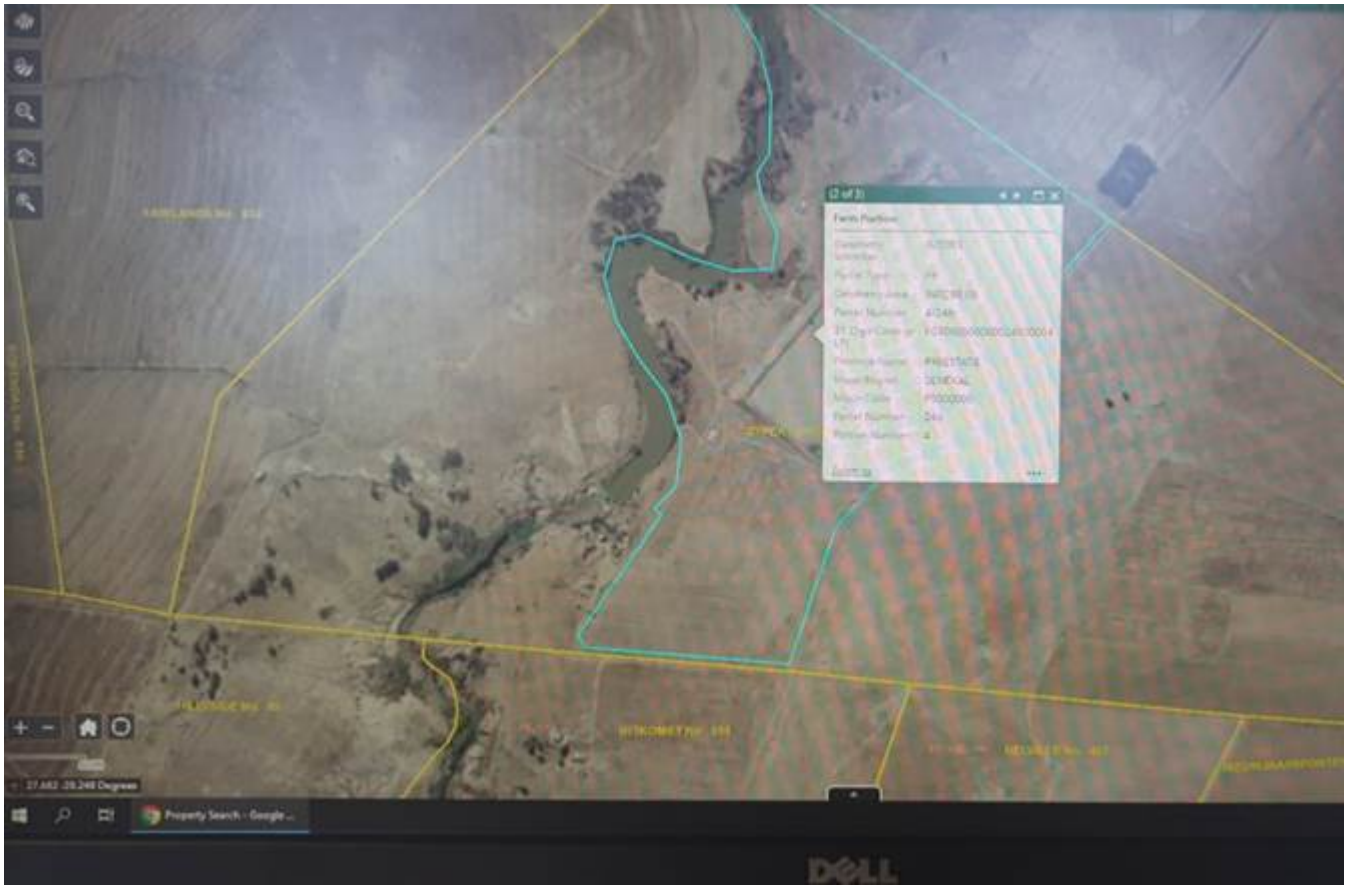
With reference to our WhatsApp discussion earlier today, the following:

1. According to the Design Report, the following area will be impacted upon due to the proposed activities:

2. When the information in the Design Report and PlanetGIS is placed on GoogleEarth, the following is obtained:

Turquoise: Coffer Dam | White: Gabion Inlet | Pink: Abstraction Pump Station

3. As can be seen by the map that was forwarded to MDA on WhatsApp, it is evident that the study area falls on the Remainder of the farm Zyfer Fontein 246. This also corresponds to the information obtained from PlanetGIS.



4. As is known, a servitude in favour of the Municipality is registered on the Remainder of the said farm, for the required activities associated with the Bulk Water Services for the applicable Municipality.

5. Although a servitude is registered, DESTEA still requires the landowner to give consent for any activities on its property.

6. A draft of such a consent letter will be forwarded to you in due time. It will be appreciated if you could arrange for the necessary signature.

Trust that you will find the above in order.

Please do not hesitate to contact us should you require additional information on the above.

Kind regards,

Hanlie Stander

Registered Environmental Assessment Practitioner: Number 2019/1997

mda Town & Regional Planners, Environmental & Development Consultants

9 Barnes Street | Westdene | Bloemfontein | 9301
P.O. Box 100982 | Brandhof | 9324
Tel: 051 447 1583 | Fax: 051 448 9839

APPENDIX E_3

List of registered parties

Abstraction Works: Senekal Bulk Water Supply	
Table 1: List of identified possible interested and / or affected parties	
Authorities & Stakeholders	
Organization	**Contact person and contact detail**
Thabo Mofutsanyana District Municipality	The Municipal Manager Ms. Takatso Lebenya Tel: (058) 718 1036 / 1089 Fax: (058) 718 1034 Email: Takatso@Tmdm.Gov.Za Private Bag X810, Witsieshoek, 9870 1 Maimpoi Street, Old Parliament Building, Phuthaditjhaba
Setsoto Local Municipality: Municipal Manager	Mr. Tshepiso "Sugar" Ramakarane Tel: (+27 51) 933 9302 Fax: (+27 51) 933 9363 Email: Tshepiso@Setsoto.Co.Za And Manager@Setsoto.Co.Za 27 Voortrekker Street, Ficksburg
Setsoto Local Municipality: Ward Councillor: Ward 3	Ward 3: Cllr. Mamotena Lydia Mthimkulu Po Box 116, Ficksburg, 9730
Department Of Agriculture	The Assistant Director Mr Jack Morton P.O. Box 34521 Faunasig Bloemfontein 9325
Department Of Public Works: Property Manager	Department Of Land Affairs Director Property Management Of The Provincial Department Of Public Works & Infrastructure Ms Agnes Ntilane 136 Charlotte Mareka Street Bloemfontein 9300 Ntilanea@Fsworks.Gov.Za
Department Of Water And Sanitation	Mr. W Grobler Private Bag X528 Bloemfontein 9300 Groblerw@Dws.Gov.Za
SAHRA	South African Heritage Resources Agency (SAHRA) Head Office 111 Harrington Street

Abstraction Works: Senekal Bulk Water Supply	
Table 1: List of identified possible interested and / or affected parties	
	Cape Town 8001 (Online Notification)
SAHRA Free State	Ntando PZ Mbatha Heritage Coordinator Corner Henry And East Burger Street Department Of Sport Arts Culture And Recreation Office 204 Bloemfontein 9301
Eskom	Phindi Rapudungoane Land And Rights Officer Tell: 051 4042284 Fax: 086 5398399 Phindi.Rapudungoane@Eskom.Co.Za Mahlatse Moeng Environmental Officer Land Development And Environment Eskom Distribution-FSOU Eskom Centre First Floor 120 Henry Street Westdene Bloemfontein Tel: 051 404 2287 Cell: 079 199 0679 Fax: 086 604 5709 Email: Mahlatse.Moeng@Eskom.Co.Za
CAA	Lizell Stroh strohl@caa.co.za

APPENDIX E4

List of comments received

agriculture, land reform & rural development

Department:
Agriculture, Land Reform and Rural Development
REPUBLIC OF SOUTH AFRICA

Free State Provincial Shared Service Centre, Private Bag X20546, Bloemfontein, 9300;
Tel (051) 400 4200, Fax (051) 430 2392

To whom it may concern:

It is hereby certified that:

I, **Steve Modise** as the Acting Chief Director: Free State Provincial Shared Service Centre am hereby authorized by the National Government of the Republic of South Africa (Department of Agriculture, Land Reform and Rural Development) [landowner] to submitted the proposed application to DESTEA and DWS with regards to the proposed Abstraction Works to be constructed on the Remainder of the farm Zyfer Fontein 246, Senekal. The proposed construction activities will be limited to the existing registered servitude located on the said property.

Setsoto Local Municipality is also given permission to undertake any study on the above-mentioned property (servitude area) as required by DESTEA and DWS in this regard, with all costs to the said Local Municipality.

Permission to the said Local Municipality will be granted in terms of the Notarial Deed 271s/1960.

Signed on 21 th day of June 2022 at Bloemfontein.

Signature

Contact information of the landowner:

Tel: 051-4004200

Postal Address: 136 Charlotte Maxeke Street SA Eagle Building Bloemfontein 9301.

Fax: _____

Cell: 0810683858

E-mail:
steve.modise@dalrrd.gov.za

No further comments were received to date.

Any comments received during the PPP will be included in the fBAR.

APPENDIX E_5

Response to comments received

The letter from the Department of Agriculture, Land Reform and Rural Development was included in the BAR document. The letter states that the said Setsoto Local Municipality is given permission to undertake any study on the relevant property as required by DESTEA and DWS in this regard, with all costs to the said Local Municipality.

The above is noted.

Any further comments received during the PPP will be addressed in the fBAR.

APPENDIX E_6

Proof of submission of dBAR to registered parties

To be attached to fBAR.

APPENDIX F

Impact Assessment

IMPACT ASSESSMENT

The proposed construction of a new abstraction works and the possible upgrading of certain infrastructure associated with the existing abstraction works at the Sand River, Senekal, Free State

Proponent: Setsoto Local Municipality
MDA Ref No: 40884
Date: May 2022

mda
Town & Regional Planners,
Environmental & Development
Consultants

Physical Address: 9 Barnes Street,
Westdene, Bloemfontein, 9301
Postal Address: PO Box 100982,
Brandhof, 9324
Tel: 051 4471583, Fax: 051 448 9839
E-mail: admin@mdagroup.co.za

1. METHODOLOGY

1.1. Impact assessment must take into account the nature, scale and duration of effects on the environment whether such effects are positive (beneficial) or negative (detrimental). Each issue / impact is also assessed according to the project stages from planning, through construction and operation to the decommissioning phase. Where necessary, the proposal for mitigation or optimization of an impact is noted. A brief discussion of the impact and the rationale behind the assessment of its significance has also been included.

1.2. A rating system is applied to the potential impact on the receiving environment and includes an objective evaluation of the mitigation of the impact. In assessing the significance of each issue, the following criteria (including an allocated point system) is used:

Table: Criteria for the classification of an impact	
NATURE	
A brief description of the environmental aspect being impacted upon by a particular action or activity is presented.	
EXTENT (SCALE)	
Considering the area over which the impact will be expressed. Typically, the severity and significance of an impact have different scales and as such bracketing ranges are often required. This is often useful during the detailed assessment phase of a project in terms of further defining the determined significance or intensity of an impact.	
Site	Within the construction site
Local	Within a radius of 2 km of the construction site
Regional	Provincial (and parts of neighbouring provinces)
National	The whole of South Africa
DURATION	
Indicates what the lifetime of the impact will be.	
Short-term	The impact will either disappear with mitigation or will be mitigated through natural process in a span shorter than the construction phase
Medium-term	The impact will last for the period of the construction phase, where after it will be entirely negated
Long-term	The impact will continue or last for the entire operational life of the development, but will be mitigated by direct human action or by natural processes thereafter

Table: Criteria for the classification of an impact	
Permanent	The only class of impact which will be non-transitory. Mitigation either by man or natural process will not occur in such a way or in such a time span that the impact can be considered transient
INTENSITY	
Describes whether an impact is destructive or benign.	
Low	Impact affects the environment in such a way that natural, cultural and social functions and processes are not affected.
	It is important to note that the status of an impact is assigned based on the status quo – i.e. should the project not proceed. Therefore not all negative impacts are equally significant.
Medium	Effected environment is altered, but natural and social functions and processes continue albeit in a modified way, cultural
High	Natural, cultural and social functions and processes are altered to extent that they temporarily cease
Very high	Natural, cultural and social functions and processes are altered to extent that they permanently cease
PROBABILITY	
Describes the likelihood of an impact actually occurring.	
Improbable	Likelihood of the impact materializing is very low
Possible	The impact may occur
Highly probable	Most likely that the impact will occur
Definite	Impact will certainly occur
SIGNIFICANCE	
Significance is determined through a synthesis of impact characteristics. It is an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required.	
Low impact	No permanent impact of significance. Mitigatory measures are feasible and are readily instituted as part of a standing design, construction or operating procedure
Medium impact	Mitigation is possible with additional design and construction inputs
High impact	The design of the site may be affected. Mitigation and possible remediation are needed during the construction and/or operational phases. The effects of the impact may affect the broader environment

Table: Criteria for the classification of an impact	
Very high impact	The design of the site may be affected. Intensive remediation as needed during construction and/or operational phases. Any activity which results in a "very high impact" is likely to be a fatal flaw.
STATUS	
Denotes the perceived effect of the impact on the affected area.	
Positive	Beneficial impact
Negative	Deleterious or adverse impact
Neutral	Impact is neither beneficial nor adverse

The suitability and feasibility of all proposed mitigation measures will be included in the assessment of significant impacts. This will be achieved through the comparison of the significance of the impact before and after the proposed mitigation measure is implemented.

DESCRIPTION AND ADDRESSING OF POSSIBLE IMPACTS, ISSUES AND CUMULATIVE IMPACTS

Developments such as these do have, like many other types of developments, various direct but also indirect impacts on the environment. These impacts have to be managed in order to have the minimum environmental impact and the maximum benefit to man.

Issues identified during the Basic Assessment process are discussed and assessed below:

1. VEGETATION DESTRUCTION						
Assessment						
Mitigation Status	**Extent**	**Duration**	**Intensity**	**Probability**	**Significance**	**Status**
Without Mitigation	Local	Permanent	Very high	Definite	High	Negative
With Mitigation	Site	Long term	High	Definite	Medium	Negative
Recommendation						
Phase	**Description of recommendation**					
General	• Please refer to the Specialist Reports in Appendix D for more recommendations					
Planning Phase	• None					
Construction phase and operational phase	• Establishment of alien / invader vegetation will be monitored and these species will be removed by hand or by an approved chemical before gestation thereof. • Vegetation clearance will be limited to the required area. • A permit for the removal of protected plant species will be obtained before the removal of these species (if any). • Care should be taken to limit unnecessary destruction of the natural vegetation. • All human movement and activities must be contained within designated construction areas and the planned site access road in order to prevent peripheral impacts on surrounding natural habitat. • No fire-wood may be collected in the veld without permission from the landowner. • Alien control and monitoring programme must be developed. • Visual inspections should be undertaken regularly to ensure environmental compliance. • If erosion is evident, proper erosion control measures should be implemented as soon as possible. • No littering may be allowed and all litter must be removed from the site. • Monitoring of construction activities and compliance with recommended mitigation measures must take place. • The necessary authorisations must be acquired from Department of Water and Sanitation (DWS) before the proposed construction activities at the watercourse may be undertaken. • Surrounding natural vegetation should not be harmed / removed, where possible. • Should any protected plant specimens require removal, the necessary permits will have to be obtained to do so. Any removed specimens should be transplanted to an adjacent area where						

1. VEGETATION DESTRUCTION	
	it will remain unaffected. • Undertaking of construction activities within the watercourse should be limited to winter months (May to September) where possible, as it will limit the possibility of the site to be affected by flooding and disturbance will also be limited. • Vehicles should make use of a single access road into and out of the main channel. • After the construction activities are completed, any disturbances to the banks, vegetation or wetland areas should be rehabilitated. It is important that riparian vegetation be re-established where they were removed. This can be attained by removing sods of the indigenous sedges and grasses as listed for the river and replanting these in disturbed areas • Areas where disturbance takes place is normally susceptible to the establishment of exotic weeds and invaders. It will therefore be important to monitor and eradicate any invasive weeds. • A comprehensive monitoring and rehabilitation programme should be initiated, which should be maintained at least for the duration of the construction phase, when impacts are anticipated to be most significant.
Post construction phase and rehabilitation phase	• The alien control and monitoring programme used during the construction and operational phase must be carried over into the post construction and rehabilitation phase. • Erosion should be prevented as far as possible and attended to, as serious erosion may occur at barren areas. • Return and spread topsoil cover (to original depth) over rehabilitated area. • Vegetation should be allowed to re-establish naturally over disturbed area to be rehabilitated. • Areas which show no vegetation growth nine months after completion of the rehabilitation work, must be ripped, additional topsoil spread and seeded with indigenous grass species. • Species, especially grasses, trees and shrubs occurring in the region must be used to rehabilitate disturbed areas. • Keep animals away from the site, at least until the vegetation has re-established sufficiently.

2. LOSS OF SOIL						
Assessment						
Mitigation Status	**Extent**	**Duration**	**Intensity**	**Probability**	**Significance**	**Status**
Without Mitigation	Regional	Permanent	Medium	Definite	High	Negative
With Mitigation	Local	Long-term	Medium	Definite	Medium	Negative

Recommendation	
Phase	**Description of recommendation**
General	• Please refer to the Specialist Reports in Appendix D for more recommendations
Planning Phase	• No environmental mitigation measures are required during the planning phase on the proposed site, as no mitigation measures are to be implemented on site during the planning phase. • However, the engineers, specialists and environmental consultants took various factors into consideration, to be implemented during the construction / operational phase.
Construction phase and operational phase	• Store stripped topsoil in an approved location and in an approved manner for later re-use in the rehabilitation process, for example: - Bricks may be placed around the stockpiles, to limit the loss thereof due to rainy events. - Stockpiles should not be higher than 1.5 m. - The gradient of stockpiles should not be greater than 1:1.5. • Speed limit will be enforced on the construction vehicles and these vehicles will only make use of designated roads / pathways. • Dust control measures will be implemented if nuisance dust generation occurs during the construction period. • All human movement and activities must be contained within designated construction areas and the planned site access road in order to prevent peripheral impacts on surrounding natural habitat. • Visual inspections should be undertaken regularly to ensure environmental compliance. • Storm water measures will be implemented in order to manage storm water and this will also prevent erosion. • Visual inspections for the occurrence of erosion should be undertaken on a weekly basis during the construction phase. • If erosion is evident, proper erosion control measures should be implemented as soon as possible.

2. LOSS OF SOIL	
Post construction phase and rehabilitation phase	• Erosion should be prevented as far as possible and attended to, as serious erosion may occur at barren areas. • Return and spread topsoil cover (to original depth) over rehabilitated area. • Vegetation should be allowed to re-establish naturally over disturbed area to be rehabilitated. • Best Practices should be implemented at areas which show no vegetation growth nine months after completion of the rehabilitation work, where applicable.

3. POLLUTION CONTROL						
Assessment						
Mitigation Status	**Extent**	**Duration**	**Intensity**	**Probability**	**Significance**	**Status**
Without Mitigation	Regional	Permanent	High	Definite	High	Negative
With Mitigation	Local	Long-term	Medium	Definite	Medium	Negative

Recommendation	
Phase	**Description of recommendation**
General	• Please refer to the Specialist Reports in Appendix D for more recommendations
Planning Phase	• No environmental mitigation measures are required during the planning phase on the proposed site, as no mitigation measures are to be implemented on site during the planning phase. • However, the engineers, specialists and environmental consultants took various factors into consideration, to be implemented during the construction / operational phase.
Construction phase and operational phase	• Visual inspections for the occurrence of pollution should be undertaken daily during the construction phase. • Best practices should be implemented in the case of spillages / pollution / erosion. • No waste (general / construction / potential hazardous / etc.) may be dumped. • Waste classification should be undertaken. • Suitable waste bins etc. will be available on site for the temporary disposal of waste. • Waste will be removed from site and disposed of at an authorised landfill site. • DWS should be notified of any spillage / pollution within 24 hours of occurrence within water resources. • Record should be kept on site to indicate date of visual inspection, any spillages observed, and manner in which spill was treated. • Proper erosion mitigation measures should be implemented.
Post construction phase and rehabilitation phase	• Maintenance and repair will be undertaken when necessary. • All temporary infrastructure related to the construction phase will be removed from site. • Temporary concrete surfaces (if any) will be removed and compacted areas rehabilitated according to Best Practices. • No waste will be dumped on site and any waste occurring on site will be removed and disposed of according to best practices.

4. LOSS OF ANIMAL LIFE						
Assessment						
Mitigation Status	**Extent**	**Duration**	**Intensity**	**Probability**	**Significance**	**Status**
Without Mitigation	Local	Permanent	Medium	Definite	High	Negative
With Mitigation	Local	Long-term	Medium	Definite	Medium	Neutral
Recommendation						
Phase	**Description of recommendation**					
General	• Please refer to the Specialist Reports in Appendix D for more recommendations					
Planning Phase	• No environmental mitigation measures are required during the planning phase on the proposed site, as no mitigation measures are to be implemented on site during the planning phase. • However, the engineers, specialists and environmental consultants took various factors into consideration, to be implemented during the construction / operational phase.					
Construction phase and operational phase	• No animals may be captured / harmed / killed on site. • Specialists should be appointed to remove / translocate species, if required. The necessary permits should also be obtained. • Any occurrences of harmed animals should be reported to the ECO, the required steps should be taken and should be recorded as such.					
Post construction phase and rehabilitation phase	• No animals may be captured / harmed / killed on site. • Specialists should be appointed to remove / translocate species, if required. The necessary permits should also be obtained. • Any occurrences of harmed animals should be reported to the ECO, the required steps should be taken and should be recorded as such.					

5. Surface Water						
Assessment						
Mitigation Status	**Extent**	**Duration**	**Intensity**	**Probability**	**Significance**	**Status**
Without Mitigation	Regional	Permanent	Medium	Definite	High	Negative
With Mitigation	Local	Long-term	Medium	Definite	Medium	Neutral

Recommendation	
Phase	**Description of recommendation**
General	• Please refer to the Specialist Reports in Appendix D for more recommendations.
Planning Phase	• No environmental mitigation measures are required during the planning phase on the proposed site, as no mitigation measures are to be implemented on site during the planning phase. • However, the engineers, specialists and environmental consultants took various factors into consideration, to be implemented during the construction / operational phase.
Construction phase and operational phase	• Storm water measures will be implemented in order to manage storm water and this will also prevent / limit erosion. • The necessary authorisations (altering and impeding of beds / banks of water sources) should be obtained from DWS. • Daily inspections for the occurrence of surface water - and soil pollution are to be undertaken, during the construction phase. • Best practices should be implemented in the case of spillages / pollution / erosion at the waterways. • Best practices should be implemented to rehabilitate wetlands, where required.
Post construction phase and rehabilitation phase	• Disturbed waterways should be rehabilitated according to best practices. • All polluted areas should be cleaned as soon as possible. • Waste to be removed from site.

6. VISUAL IMPACT

The visual impact of the proposed development in the landscape is the function of several factors of which the viewing distance, visual absorption capacity and landform are measurable. Other factors are difficult to categorize because they are subjective viewpoints.

The visual impact for the proposed development is largely due to:

- The topography in terms of elevation and aspect;
- The vegetative cover in terms of its extent and height;
- The extent of the proposed development;
- Distance from point of origin; and
- The low visual absorption capacity of the surrounding landscape.

Factors of visual impact

Visual character:

The visual character of an area has different elements that provide an overall perceived ambience. In the consideration of the visual character of a site, it is important to include not only the internal land use but that of the surrounding land as well.

At this site, the visual character is mainly the town of Senekal, agricultural area adjacent to the town of Senekal, water reservoirs as well as the existing De Put Dam and its associated infrastructures that are located within viewing distance of the site.

Scale of landscape:

Visual scale is the apparent size relationships between landscape components and their surroundings (Smardon, et al. 1986).

Visual analysis:
In this section the intensity of the visual impact of the development on the surrounding area is described. Aspects such as viewshed, visual absorption capacity and the appearance of the development from critical viewpoints will be used to determine this impact.

The areas surrounding the proposed abstraction works has been degraded and transformed to varying degrees, but with patches of natural vegetation also being present. The areas along the floodplain of the river and portions adjacent to the abstraction works do however still consist of natural vegetation but with several areas being degraded by construction and the existing water works. It should therefore be evident that the surroundings has been degraded and transformed to a significant degree. A portion of remaining natural vegetation has however been observed to the west of the dam and here elements of conservation value was also identified.

The majority of the site and surroundings have been degraded. Remaining natural vegetation is dominated by pioneer species and exotic weeds which confirm a degraded condition. These areas are considered of Low conservation value. Furthermore, the natural vegetation type in this area, Central Free State Grassland, is currently of Least Concern (LC) and therefore does not contribute toward the conservation value of natural vegetation. This is also confirmed by the Free State Biodiversity Management Plan which regards the area as an Ecological Support Area 1 & 2 which, although of low conservation value, does still aid in the functioning of the Sand River. However, the exception to the above, is a portion of remaining natural grassland to the west of the Cyferfontein Dam. Here, a substantial species diversity is present with many protected species and somewhat rarer species also being present. As a consequence, this area is regarded as having a High conservation value and should be excluded from the development and treated as a no-go area. It should be avoided by the proposed development as well as any associated activities, i.e. laydown areas, stockpile yards and vehicle movement. Ample areas are available for construction and it should not be difficult to avoid this portion. The Sand River itself as well as the associated floodplain and wetland areas should be regarded as having a Very High conservation value.

The proposed abstraction works will affect a portion of the main channel of the Sand River. These impacts are anticipated to be most pronounced during construction and immediately thereafter.

Soil samples taken along the bank of the Sand River indicate a permanent zone of wetness along the marginal zone (water's edge) and is considered that saturated soil conditions exist year-round. These wetland conditions steadily decrease up the bank but it was clear that a seasonal zone of wetness still exists along the banks and seepage areas are also present. Temporary wetland conditions were also observed at the upper boundary of

the upper zone and this indicated the border of wetland conditions. The banks and floodplain of the river is quite steep here and consequently an extensive floodplain is absent. The floodplain is narrow, steep and without any visible wetland conditions. The edge between this narrow floodplain and the surrounding terrestrial environment is visible where the steep slope levels off into the surrounding plain and surface dolerite outcrops, indicating the edge of the riparian zone.

The off-channel Cyferfontein storage dam, abstracts water from the main channel and in so doing decreases the baseflow of the river which alters the flow regime significantly. The weir associated with this dam also act as flow barrier, and although not as significant as an in-channel storage dam, would also cause retardation of flow and obstruct flooding events and would therefore impact on the flow and flooding regime of the river. The weir has clearly also resulted in a significant change in the riparian zonation of the river. The baseflow water level has been elevated by the weir, essentially submerging the original and natural marginal zone and lower portion of the lower zone. These zones have now moved up the bank of the river, thus narrowing the original zones and significantly modifying the banks of the river. As can be seen, the weir has clearly had a significant impact on the river.
Several significant impacts has quite significantly affected the river at the site and the bed and bank morphology has also been significantly modified, mostly as a result of the downstream weir. Despite the modifications affecting the Sand River, it is still regarded as a highly sensitive system providing numerous vital ecosystem functions including water transportation, aquatic and wetland habitat, flood attenuation and bioremediation functions.
The Sand River which will be affected by the abstraction works is still natural to a significant extent although moderately modified by large impacts associated with the downstream weir, Cyferfontein Dam and upstream dryland crop cultivation. An Index of Habitat Integrity (IHI) was conducted and indicated that the river has an Instream and Riparian IHI of Category C: Moderately Modified. The EI&S of the Sand River has been rated as being Moderate.

A Risk Assessment for the proposed abstraction works within the Sand River has been undertaken according to the Department of Water & Sanitation's requirements for risk assessment and the provisional Risk Assessment Matrix for Section 21(c) & (i) water use. The majority of impacts should occur during the construction phase and should largely be limited to it, provided that adequate rehabilitation and monitoring is undertaken after construction has been completed. The initial impacts of construction will entail the removal of riparian vegetation and substantial disturbance of the banks of the river at the abstraction site. This will destabilise the bank of the river and will result in erosion of the bank and sedimentation of the river. The construction works will also require the construction of a temporary coffer dam which will allow for dewatering a portion of the main channel of the river to allow for construction to take place. This will also have substantial impacts on the river.

Initial impacts will be high when disturbance and infilling of the bed is undertaken. This is likely to release high volumes of sediment into the river. During construction this coffer dam will also require continuous dewatering in order to ensure that the construction area remains dry for construction. This water infiltration is also highly likely to become contaminated by construction waste such as cement, oils and grease and similar construction materials. The proposed abstraction works will result in significant impacts on the banks and main channel of the river. A comprehensive monitoring programme should therefore be followed to quantify impacts and recommend mitigation.

Site evaluation in terms of visual impact

Visual assessment ratings rates each criterion listed in the table from, high, medium to low according to specific characteristics of those criteria.

Visual assessment criteria used to determine the degree of visual impact of the proposed activities on the environment (adapted from Klapwijk 1998)			
CRITERIA	**HIGH**	**MEDIUM**	**LOW**
Visibility	Very visible from many places beyond 1km	Visible from within 1km zone but partially obscured by intervening objects	Only partially visible within the 1km zone and beyond due to screening by intervening objects
Visual quality	A very attractive setting	A setting with some aesthetic and visual merit	A setting which has little aesthetic merit
Visible man-made structures	Buildings as a dominant visual element	Buildings as a partial visual element	Buildings as a minor visual element
Surrounding landscape compatibility	Cannot accommodate proposed development without appearing totally out of place.	Can accommodate the proposed development without appearing totally out of place	Usually suits or matches the proposed development
Character of site or surrounding area	Exhibits a definite character	Exhibits some character	Little or no character
Contrast between human scale and vertical & horizontal	There is high contrast	Landscape with some contrast	Limited vertical variation. Most elements are related to human and horizontal

Visual assessment criteria used to determine the degree of visual impact of the proposed activities on the environment (adapted from Klapwijk 1998)			
CRITERIA	**HIGH**	**MEDIUM**	**LOW**
elements in the landscape			scale
Visual absorption capacity (VAC)	Inability of landscape to visually absorb a development because of a limited vegetation cover, flat slope and uniform texture	The lower ability of the landscape to visually absorb the development due to less diverse landform, vegetation & texture	The ability of landscape to easily accept visually a particular development because of its diverse landform, vegetation and texture
View distance (uninterrupted)	More than 5km	Between 5km & 1km	Between 1km & 500m
Critical views	Views of the development are to be seen by many people passing on road routes and from prominent areas	Some views of the development from surrounding routes and housing	Limited views to the development from roads and housing

Results and conclusions on visual impact of development assessment

Aspect	Result
Visibility	MEDIUM TO LOW
Visual quality	MEDIUM TO LOW
Visible man-made structures	MEDIUM TO LOW
Surrounding landscape compatibility	MEDIUM TO LOW
Character of site or surrounding area	MEDIUM TO LOW
Contrast between human scale, vertical & horizontal elements in the landscape	MEDIUM TO LOW
Visual absorption capacity (VAC)	MEDIUM TO LOW
View distance (uninterrupted)	MEDIUM TO LOW
Critical views	MEDIUM TO LOW

The proposed development will have a medium visual impact. This is largely due to:

- The extent of the development
- The surrounding agricultural as well as residential areas, the locality of the existing weir, water reservoirs, the De Put Dam and its associated infrastructures.

APPENDIX G

Environmental Management Programme (EMPr)

ENVIRONMENTAL MANAGEMENT PROGRAMME

The proposed construction of a new abstraction works and the possible upgrading of certain infrastructure associated with the existing abstraction works at the Sand River, Senekal, Free State

Proponent: Setsoto Local Municipality
MDA Ref No: 40884
Date: May 2022

Town & Regional Planners,
Environmental & Development
Consultants

Physical Address: 9 Barnes Street,
Westdene, Bloemfontein, 9301
Postal Address: PO Box 100982,
Brandhof, 9324
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1. INTRODUCTION

1.1 Project and associated construction activities

The proposed project entails the construction of a new abstraction works and the upgrading of certain infrastructure associated with the existing abstraction works at the Sand River, Senekal.

Please refer to the map in Appendix A of the Basic Assessment Report for an indication on the locality of the proposed activities.

1.1 Objectives of the EMPr

The EMPr aims to fulfil the requirements in terms of the National Environmental Management Act (Act 107 of 1998), with the following objectives:

- To identify, predict and evaluate actual and potential impacts on the environment, socio-economic conditions and cultural heritage, the risks and consequences and alternatives and options for mitigation of activities, with a view to minimizing negative impacts, maximizing benefits and promoting compliance with the principles of environmental management;
- To identify and employ the modes of environmental management best suited to ensuring that the activity is pursued in accordance with best environmental management practices;
- To be able to respond to unforeseen events; and
- To provide feedback on compliance.

1.2 Implementation of the EMPr

The proponent, namely Mangaung Metropolitan Municipality is responsible for the implementation of the EMPr. All contractors should be supplied with a copy of the EMPr and should ensure that construction staff adheres to the mitigation measures.

2. PREPARATION OF THE EMPR

2.1 Person(s) who prepared the EMPr

i) Mr Neil Devenish
ii) Me Hanlie Stander

MDA
P.O. Box 100982
Brandhof
Bloemfontein
9324
Tel: 051 447 1583
Fax: 051 448 9839

2.2 Expertise of the person(s) who prepared the EMPr

i) Mr Neil Devenish

Key qualifications:
- Key competencies and experience include development control applications (applications and appeals pertaining to rezoning, consolidations, subdivisions etc.) township establishment applications, environmental management and control applications.

Education:
- B. A. (Sociology, Geography) University of the Free State, SA, 1994
- Master of Town and Regional Planning, University of the Free State, SA, 1996
- Managing the Environmental Impact Assessment Process, Environmental Management Unit, PU for CHE, 2000
- Environmental Management Consulting, South African Institute of Ecologists & Environmental Scientists, 2001
- Water Law of South Africa, The South African Institution of Civil Engineers (SAICE), 2006

ii) Me Hanlie Stander

Key qualifications:
- Key competencies and experience include environmental management and research in zoology and environmental management.

Education:
- B.Sc. (Zoology), University of the Free State, South Africa, 2005
- B.Sc. Honors (Zoology), University of the Free State, South Africa, 2006
- M.Sc. (Zoology), University of the Free State, South Africa, 2012

3. RECOMMENDED MANAGEMENT AND MITIGATION MEASURES

ECO - Environmental Control Officer / IECO - Independent Environmental Control Officer

Compliance and Monitoring					
Objective	**Mitigation Measure**	**Executing Party**	**Monitoring Party**	**Timeframe**	**Project Stage**
Record keeping of compliance and monitoring reports	1. The applicant will ensure that the contractors adhere to the recommendations of the EMPr and conditions of the Environmental Authorisation during construction.	Applicant / Contractor	Contractor / ECO / Applicant	On-going	During planning, construction and rehabilitation phase
	2. An Environmental Control Officer (ECO) will be appointed to monitor the construction phase. Note that the ECO may be appointed separately or can be part of the contractor's team.	ECO / Contractor	IECO	On-going	During construction and rehabilitation phase
	3. Regular monitoring and / or spot inspections at least every fortnight during the construction phase is recommended.	ECO / Contractor	ECO/ IECO	On-going	During construction and rehabilitation phase
	4. Inspections should be documented and any shortcomings addressed immediately.	ECO / Contractor	ECO/ IECO	On-going	At all phases

Compliance and Monitoring					
Objective	**Mitigation Measure**	**Executing Party**	**Monitoring Party**	**Timeframe**	**Project Stage**
	5. A report will be provided by the independent ECO to the contractor upon completion thereof. The findings thereof should be made available to the competent authority (for example DESTEA, DWS), should it be requested.	IECO / Contractor	ECO/ DESTEA / DWS	On-going	At all phases
	6. Any emergency or unforeseen impact will be reported to the relevant environmental department / DWS within 24 hours after identification for telephonic approval and will be confirmed in writing.	ECO / Contractor	ECO/ IECO / DWS / DESTEA	On-going	At all phases
	7. The rehabilitated area (previously disturbed area) must be routinely audited and Best Practices implemented, where required (e.g. should erosion be evident / the re-establishment of vegetation not be sufficient).	Applicant	DWS / DESTEA	On-going	During operational phase
	8. Material Safety Data Sheets (MSDS) should be available on site. Where possible and available, MSDS should include information on ecological impacts and measures to minimize negative environmental impacts during accidental	ECO / Contractor	ECO/ IECO / DWS / DESTEA	On-going	During construction and rehabilitation phase

Compliance and Monitoring					
Objective	**Mitigation Measure**	**Executing Party**	**Monitoring Party**	**Timeframe**	**Project Stage**
	releases or escapes.				
	9. Procedures in the MSDS should be implemented in case of an emergency	ECO / Contractor	ECO/ IECO / DWS / DESTEA	On-going	During construction and rehabilitation phase
	10. The following documents should be available on site, and made available to the competent authority on request (if applicable): - Complaints Register - Environmental Incident Register - Disposal Certificates of waste generated as a result of the construction activities. - Environmental Monitoring (Audit) Reports - Written Corrective Action Instructions - Environmental Authorisation - DWS Permit / License - Blasting Permit - EMPr	ECO / Contractor	ECO/ IECO / DWS / DESTEA	On-going	During construction and rehabilitation phase

Planning and Design phase					
Objective	**Mitigation Measure**	**Executing Party**	**Monitoring Party**	**Timeframe**	**Project Stage**
Planning and design NOTE: Should the following aspects not be taken into consideration during the Planning and Design Phase, the environmental impacts associated with the construction and operation phase will be	1. No environmental mitigation measures are required during the planning phase on the proposed site, as no mitigation measures are to be implemented on site during the planning phase.	Applicant / Engineers / Environmental Consultant / Contractor	Applicant	On-going	During planning and design phase
	2. The design and layout of the proposed project will take the possibility of flooding, erosion and pollution into consideration	Applicant / Engineers / Environmental Consultant / Contractor	Applicant	On-going	During planning and design phase
	3. The applicant, engineers, environmental consultants and specialists should take the following steps during the planning phase: - Permits will be obtained for the removal / transplantation of protected species (if any) that are located within the construction area where no alternatives are possible.	Applicant / Engineers / Environmental Consultant / Contractor	Applicant	On-going	During planning and design phase

Planning and Design phase					
Objective	**Mitigation Measure**	**Executing Party**	**Monitoring Party**	**Timeframe**	**Project Stage**
of high significance as the environment will be negatively affected.	- A monitoring system should be implemented to determine the occurrence (if any) of any fuel / oil spillages during the construction phase. - The necessary Environmental Authorisation will be obtained before any activities listed in the Regulations are undertaken. - In addition, the necessary DWS registrations will be obtained, before any construction activities near watercourses are undertaken. - The necessary precautions with regard to road safety will be implemented for construction work to be undertaken within road crossings (if any). - Proper sanitation, potable water and waste facilities will be in place before construction activities are undertaken. - A blasting permit will be obtained before blasting activities is undertaken (if any).				

Construction phase					
Objective	**Mitigation Measure**	**Executing Party**	**Monitoring Party**	**Timeframe**	**Project Stage**
General measures to consider	1. Any construction is disruptive and the environment must be given consideration with every activity undertaken	Contractor	ECO / IECO	On-going	During construction phase
	2. All relevant standards relating to legislation should be adhered to (including waste emissions, waste disposal, noise regulations, etc.)	Contractor	ECO / IECO	On-going	During construction phase
	3. According to Section 28 of the NEMA Act 107, every person who cause, has caused or may cause significant pollution or degradation of the environment must take reasonable measures to prevent such pollution or degradation from occurring, continuing or recurring and if it can't be avoided or stopped, to minimize and rectify such pollution or degradation of the environment.	Contractor	ECO / IECO	On-going	During construction phase

Construction phase					
Objective	**Mitigation Measure**	**Executing Party**	**Monitoring Party**	**Timeframe**	**Project Stage**
	4. The pollution control provision in Section 19(1) of the National Water Act (Act 36 of 1998) should be adhered to at all times.	Contractor	ECO / IECO	On-going	During construction phase
	5. ECO should be provided with a layout of the site, indicating the position of the following prior to the site establishment, for acceptance: - Ablution Facilities - Storage Areas - Ready-mix Areas - Stockpile Areas - Waste Disposal Facilities - Hazardous Substances Storage Area - Etc.	Contractor / ECO	ECO / IECO	On-going	During construction phase
	6. Designate the boundaries of the active construction start-up site, by erecting fencing / danger tape (where applicable)	Contractor	ECO / IECO	On-going	During construction phase
	7. Fence off operational footprint area (if possible) to ensure all operational activities are contained within the designate area.	Contractor	ECO / IECO	On-going	During construction phase

Construction phase					
Objective	**Mitigation Measure**	**Executing Party**	**Monitoring Party**	**Timeframe**	**Project Stage**
	8. All construction and operational activities must be contained within the demarcated area determined in consultation with the ECO.	Contractor / ECO	ECO / IECO	On-going	During construction phase
	9. Care will be taken to prevent unnecessary damage to vegetation near to construction activities.	Contractor	ECO / IECO	On-going	During construction phase
	10. The necessary precautions with regard to road safety will be implemented for construction work within road crossings (if any).	Contractor	ECO / IECO	On-going	During construction phase
	11. Proper sanitation, water and waste facilities will be in place for construction workers throughout the construction phase.	Contractor	ECO / IECO	On-going	During construction phase
	12. Chemical toilets will be cleaned and serviced regularly, and proof thereof will be available on site.	Contractor	ECO / IECO	On-going	During construction phase
	13. Potable water will be made available daily to workers on site.	Contractor	ECO / IECO	On-going	During construction phase
	14. Fire-fighting equipment will be available on site, where applicable.	Contractor	ECO / IECO	On-going	During construction phase

Construction phase					
Objective	**Mitigation Measure**	**Executing Party**	**Monitoring Party**	**Timeframe**	**Project Stage**
	15. If artefacts or graves are uncovered during construction activities, work in the immediate vicinity will be stopped until the project Archaeologist and SAHRA has been consulted.	Contractor	ECO / IECO	On-going	During construction phase
	16. Adjacent landowners will be notified of proposed blasting, 24 hours prior to blasting activities.	Contractor	ECO / IECO	On-going	During construction phase
Site access	1. Necessary drawings for the upgrading of intersections (if any) are to be submitted to the relevant authority (SANRAL / Provincial Department of Roads / Municipality's Department of Roads) for approval, and the upgrades are to be implemented	Applicant / Contractor	ECO / IECO	On-going	During construction phase
	2. The current access road should be improved, when required	Contractor	ECO / IECO	On-going	During construction phase
	3. Proper storm water measures are to be implemented to avoid run-off of water and washing of sand / soil onto the road	Contractor	ECO / IECO	On-going	During construction phase

Construction phase					
Objective	**Mitigation Measure**	**Executing Party**	**Monitoring Party**	**Timeframe**	**Project Stage**
	4. Erosion measures will be implemented	Contractor	ECO / IECO	On-going	During construction phase
	5. Removal of vegetation will be kept to the required area	Contractor	ECO / IECO	On-going	During construction phase
	6. No animals will be hunted / captured on site (only to be undertaken by a relevant specialist)	Contractor / ECO	ECO / IECO	On-going	During construction phase
Employee conduct on site	1. No animals may be harmed / captured / trapped and / or hunted. This must be strictly enforced.	Contractor / ECO	ECO / IECO	On-going	During construction phase
	2. Animals found at the construction site will be removed and relocated to an appropriate area, by a suitable, qualified person	Contractor / ECO	ECO / IECO	On-going	During construction phase
	3. No open fires allowed. Provision will be made that no accidental fires are started.	Contractor / ECO	ECO / IECO	On-going	During construction phase
	4. No firewood will be collected on site or in surrounding areas, without written approval from the landowner.	Contractor / ECO	ECO / IECO	On-going	During construction phase

Construction phase					
Objective	**Mitigation Measure**	**Executing Party**	**Monitoring Party**	**Timeframe**	**Project Stage**
	5. No smoking or open fires will be allowed near storage facilities	Contractor / ECO	ECO / IECO	On-going	During construction phase
	6. No waste may be dumped on site	Contractor / ECO	ECO / IECO	On-going	During construction phase
	7. Employees should make use of the ablution facilities provided	Contractor / ECO	ECO / IECO	On-going	During construction phase
Soil, erosion and vegetation management	1. Construction activities will be limited to designated construction areas to prevent peripheral impacts on surrounding natural habitats. Construction vehicles will also keep to constructed roads where possible, so that natural vegetation is not destroyed unnecessarily.	Contractor / ECO	ECO / IECO	On-going	During construction phase
	2. Access roads or temporary crossings must be non-erosive, structurally stable and not induce flooding / safety hazard.	Contractor / ECO	ECO / IECO	On-going	During construction phase
	3. If any access road or temporary crossing is impaired, it will be repaired immediately to prevent any future /	Contractor / ECO	ECO / IECO	On-going	During construction phase

Construction phase					
Objective	**Mitigation Measure**	**Executing Party**	**Monitoring Party**	**Timeframe**	**Project Stage**
	further damage.				
	4. All human movement and activities will be contained within designated construction areas in order to prevent peripheral impacts on surrounding natural habitat.	Contractor / ECO	ECO / IECO	On-going	During construction phase
	5. Erosion management is important. Rehabilitation measures must be monitored to ensure that no erosion has occurred and the disturbed areas have been adequately re-vegetated.	Contractor / ECO	ECO / IECO	On-going	During construction phase
	6. Concurrent rehabilitation of disturbed areas will be undertaken to help the recovery of the vegetation.	Contractor / ECO	ECO / IECO	On-going	During construction phase
	7. Stockpiled soil to be used for the rehabilitation of the disturbed area will be stockpiled in an area where it will not be disturbed by vehicles.	Contractor / ECO	ECO / IECO	On-going	During construction phase
	8. Stockpiled soil will be protected from washing away during rainstorms. For example: - One layer of bricks or stones can be placed around the stockpiled topsoil.	Contractor / ECO	ECO / IECO	On-going	During construction phase

Construction phase					
Objective	**Mitigation Measure**	**Executing Party**	**Monitoring Party**	**Timeframe**	**Project Stage**
	- Bricks may be placed around the stockpiles, to limit the loss thereof due to rainy events. - Stockpiles should not be higher than 1.5 m. - The gradient of stockpiles should not be greater than 1:1.5.				
	9. Stockpiles should be located away from drainage lines, watercourses and areas of temporary flood	Contractor / ECO	ECO / IECO	On-going	During construction phase
	10. All soil excavated, is to be separated into top- and subsoil. Stockpiled subsoil must be used for backfilling and stockpiled topsoil for landscaping and rehabilitation of disturbed areas	Contractor / ECO	ECO / IECO	On-going	During construction phase
	11. Stockpiled material will be placed on the cleared areas once construction is completed. Re-spreading of topsoil is preferably to be done to the natural level.	Contractor / ECO	ECO / IECO	On-going	During construction phase
	12. Fertilisers should be used where topsoil and subsoil were mixed or where the topsoil is not up to original standard	Contractor / ECO	ECO / IECO	On-going	During construction phase

Construction phase					
Objective	**Mitigation Measure**	**Executing Party**	**Monitoring Party**	**Timeframe**	**Project Stage**
	13. Indigenous tree species (if any) in the vicinity of the construction site should be marked with danger tape. Disturbance to such species should be avoided, where possible.	Contractor / ECO	ECO / IECO	On-going	During construction phase
	14. A permit for the removal of protected plant species will be obtained before the removal of these species (if any).	Applicant / Contractor	ECO / IECO	On-going	During construction phase
	15. An alien control and monitoring programme will be developed starting during the construction phase and will be carried over into the operational phase.	Contractor / ECO	ECO / IECO	On-going	During construction phase
	16. Any proclaimed weed or alien species that germinates during the contract period will be cleared by hand / approved chemicals before flowering thereof.	Contractor / ECO	ECO / IECO	On-going	During construction phase
	17. Imported fill material will be monitored during and after construction for the presence of any alien species. Any such species will be removed immediately.	Contractor / ECO	ECO / IECO	On-going	During construction phase

Construction phase					
Objective	**Mitigation Measure**	**Executing Party**	**Monitoring Party**	**Timeframe**	**Project Stage**
	18. Fire fighting equipment will be available on site.	Contractor / ECO	ECO / IECO	On-going	During construction phase
	19. Species, especially grasses, trees and shrubs occurring in the region will be used to rehabilitate disturbed areas.	Contractor / ECO	ECO / IECO	On-going	During construction phase
	20. Compacted soils (such as dirt tracks not to be utilised during the operational phase) must be ripped to ensure the establishment of natural occurring vegetation.	Contractor / ECO	ECO / IECO	On-going	During construction phase
	21. Should natural re-growth be insufficient, the area should be hydro-seeded.	Contractor / ECO	ECO / IECO	On-going	During construction phase
	22. Concurrent rehabilitation should be undertaken, where possible.	Contractor / ECO	ECO / IECO	On-going	During construction phase
	23. Vegetation clearance will be limited to the required area.	Contractor / ECO	ECO / IECO	On-going	During construction phase
	24. Speed limit will be enforced on the construction vehicles and these vehicles will only make use of designated roads / pathways.	Contractor / ECO	ECO / IECO	On-going	During construction phase

Construction phase					
Objective	**Mitigation Measure**	**Executing Party**	**Monitoring Party**	**Timeframe**	**Project Stage**
	25. Dust control measures will be implemented if nuisance dust generation occurs during the construction period.	Contractor / ECO	ECO / IECO	On-going	During construction phase
	26. All archaeological findings (if any) should be recorded and reported to SAHRA. No construction activities in the area may proceed without the authorisation from SAHRA.	Contractor / ECO	ECO / IECO	On-going	During construction phase
	27. Storm water measures will be implemented in order to manage storm water and this will also prevent erosion.	Contractor / ECO	ECO / IECO	On-going	During construction phase
	28. Visual inspections for the occurrence of erosion should be undertaken on a weekly basis.	Contractor / ECO	ECO / IECO	On-going	During construction phase
	29. No animals may be captured / harmed / killed on site.	Contractor / ECO	ECO / IECO	On-going	During construction phase
	30. Any occurrences of harmed animals should be reported to the ECO and recorded as such.	Contractor / ECO	ECO / IECO	On-going	During construction phase
	31. Where possible, disturbance to the natural vegetation on site should be	Contractor / ECO	ECO / IECO	On-going	During construction phase

Construction phase					
Objective	**Mitigation Measure**	**Executing Party**	**Monitoring Party**	**Timeframe**	**Project Stage**
	limited, in order to minimize the impact on the area. Should any protected specimens require removal for the construction activities, the necessary permits will have to be obtained to do so. Any removed specimens should be transplanted to an adjacent area where it will remain unaffected (if possible).				
	32. Construction activities should be limited to winter months (May to September) when the construction activities will be least likely to be affected by flooding and disturbance will also be limited.	Contractor / ECO	ECO / IECO	On-going	During construction phase
	33. A single access road should be used on site, where possible.	Contractor / ECO	ECO / IECO	On-going	During construction phase
	34. Areas where construction activities and disturbance takes place is normally susceptible to the establishment of exotic weeds and invaders. It will therefore be important to monitor and eradicate any invasive weeds.	Contractor / ECO	ECO / IECO	On-going	During construction phase

Construction phase					
Objective	**Mitigation Measure**	**Executing Party**	**Monitoring Party**	**Timeframe**	**Project Stage**
	35. A comprehensive monitoring and rehabilitation programme should be initiated, which should be maintained at least for the duration of the construction phase, when impacts are anticipated to be most significant.	Contractor / ECO	ECO / IECO	On-going	During construction phase
Minimise contamination and sterilisation of soil	1. Use of potentially polluting and hazardous substances should be strictly controlled	Contractor / ECO	ECO / IECO	On-going	During construction phase
	2. If soil is significantly contaminated by hazardous substances, then this soil is considered as hazardous and should be disposed of according to best practices	Contractor / ECO	ECO / IECO	On-going	During construction phase
	3. Minor vehicle repair / maintenance will be conducted on site, and impacts like oil spills should be appropriately mitigated. Spill response procedures must be clearly defined and well known by all staff.	Contractor / ECO	ECO / IECO	On-going	During construction phase
	4. All threatened or protected plant species as specified by the NEM: Biodiversity Act (2004) will be identified on site. Permits are required for the	Contractor / ECO	ECO / IECO	On-going	During construction phase

Construction phase					
Objective	**Mitigation Measure**	**Executing Party**	**Monitoring Party**	**Timeframe**	**Project Stage**
	removal / transplantation of these plants.				
Trenching, placing of infrastructure and levelling (if any)	1. Site will be kept neat and tidy.	Contractor / ECO	ECO / IECO	On-going	During construction phase
	2. Appropriate area will be identified as a stockpiling area.	Contractor / ECO	ECO / IECO	On-going	During construction phase
	3. Speed limit will be enforced on the construction vehicles and these vehicles will only make use of designated roads / pathways.	Contractor / ECO	ECO / IECO	On-going	During construction phase
	4. Dust control measures will be implemented if nuisance dust generation occurs during the construction period.	Contractor / ECO	ECO / IECO	On-going	During construction phase
	5. Stockpiled material will be stored in such a way to limit the loss thereof. For example: - Bricks may be placed around the stockpiles, to limit the loss thereof due to rainy events. - Stockpiles should not be higher than 1.5 m.	Contractor / ECO	ECO / IECO	On-going	During construction phase

Construction phase					
Objective	**Mitigation Measure**	**Executing Party**	**Monitoring Party**	**Timeframe**	**Project Stage**
	- The gradient of stockpiles should not be greater than 1:1.5.				
	6. Noise control measures will be implemented.	Contractor	ECO / IECO	On-going	During construction phase
	7. All employees will be provided with the correct PPE.	Contractor	ECO / IECO	On-going	During construction phase
	8. Establishment of alien / invader vegetation will be monitored and these species will be removed by hand or by an approved chemical before gestation thereof.	Contractor / ECO	ECO / IECO	On-going	During construction phase
	9. All archaeological findings (if any) should be recorded and reported to SAHRA. No construction activities in the area may proceed without the authorisation from SAHRA.	Contractor / ECO	ECO / IECO	On-going	During construction phase
	10. Storm water measures will be implemented in order to manage storm water and this will also prevent erosion.	Contractor / ECO	ECO / IECO	On-going	During construction phase
	11. Visual inspections for the occurrence of erosion should be undertaken on a weekly basis.	Contractor / ECO	ECO / IECO	On-going	During construction phase

Construction phase					
Objective	**Mitigation Measure**	**Executing Party**	**Monitoring Party**	**Timeframe**	**Project Stage**
	12. No animals may be captured / harmed / killed on site.	Contractor	ECO / IECO	On-going	During construction phase
	13. Any occurrences of harmed animals should be reported to the ECO and recorded as such.	Contractor	ECO / IECO	On-going	During construction phase
Ablution Facilities	1. No open areas or the surrounding vegetation may be used as 'toilet facilities'.	Contractor	ECO / IECO	On-going	During construction phase
	2. Toilets should be available for all employees. Where waterborne sewerage is not available, the ECO must designate an area within the boundaries of the site for the erection of portable chemical toilets.	Contractor / ECO	ECO / IECO	On-going	During construction phase
	3. Toilet facilities shall occur at a minimum ration of 1 toilet per 15 employees.	Contractor / ECO	ECO / IECO	On-going	During construction phase
	4. Toilets shall be maintained in a hygienic state and serviced when required.	Contractor / ECO	ECO / IECO	On-going	During construction phase
	5. Temporary toilets should be serviced regularly and the contents be removed to a licensed disposal facility.	Contractor / ECO	ECO / IECO	On-going	During construction phase

Construction phase					
Objective	**Mitigation Measure**	**Executing Party**	**Monitoring Party**	**Timeframe**	**Project Stage**
Safeguard water resources	1. No activities will be undertaken within 32 m of a watercourse / within the 1:100 year floodline / 500m of a wetland, without the necessary authorisations (for example from DESTEA and DWS).	Contractor / ECO	IECO / DWS / DESTEA	On-going	During construction phase
	2. Caution will be taken to ensure that construction materials are not dumped or stored within storm water management systems.	Contractor / ECO	IECO / DWS / DESTEA	On-going	During construction phase
	3. Construction activities in the storm water infrastructure will be limited through proper demarcation and appropriate environmental awareness training.	Contractor / ECO	ECO / IECO	On-going	During construction phase
	4. The Contractor is responsible to inform all staff of the need to be vigilant against any practice that will have a harmful effect on waterways.	Contractor	ECO / IECO	On-going	During construction phase
	5. Infilling, excavation, drainage and hardening of surfaces will not occur unnecessarily in storm water infrastructure.	Contractor	ECO / IECO	On-going	During construction phase
	6. Emergency plans will be in place in case of fuel spillages (to limit the occurrence	Contractor	ECO / IECO	On-going	During construction phase

Construction phase					
Objective	**Mitigation Measure**	**Executing Party**	**Monitoring Party**	**Timeframe**	**Project Stage**
	of soil as well as groundwater pollution).				
	7. A monitoring system should be implemented to determine the occurrence (if any) of any fuel / oil spillages during the construction phase.	Contractor	ECO / IECO	On-going	During construction phase
	8. The necessary mitigation measures should be implemented immediately, should any leakages / spills be detected.	Contractor	ECO / IECO	On-going	During construction phase
	9. Weather forecasts from the South African Weather Bureau of up to three days in advance will be monitored on a daily basis to avoid exposing soil or construction works or materials during a storm event and appropriate action will be taken in advance to protect construction works should a storm event be forecasted.	Contractor	ECO / IECO	On-going	During construction phase
	10. All no-go areas will be demarcated under guidance of the Environmental Control Officer (ECO).	Contractor / ECO	ECO / IECO	On-going	During construction phase

Construction phase					
Objective	**Mitigation Measure**	**Executing Party**	**Monitoring Party**	**Timeframe**	**Project Stage**
	11. The design of drainage systems will ensure that there is no contamination or eutrophication. Drainage systems will be maintained regularly in order to minimize the runoff of harmful chemical substances into the waterway(s).	Contractor	ECO / IECO	On-going	During construction phase
	12. It will be ensured that the construction activities have minimal effects on the flow of water through the storm water infrastructure.	Contractor	ECO / IECO	On-going	During construction phase
	13. No erosion or siltation may occur due to any construction or operational activities.	Contractor	ECO / IECO	On-going	During construction phase
	14. Construction and operational activities should take the wetland boundaries and associated buffer zones into consideration (if any).	Contractor	ECO / IECO	On-going	During construction phase
	15. Occurrence of erosion will be monitored. Reparations will be undertaken as soon as possible.	Contractor	ECO / IECO	On-going	During construction phase
Workings within / near to	1. Storm water measures will be implemented in order to manage storm water and this will also prevent erosion.	Contractor	ECO / IECO	On-going	During construction phase

Construction phase					
Objective	**Mitigation Measure**	**Executing Party**	**Monitoring Party**	**Timeframe**	**Project Stage**
watercourses	2. Construction activities in waterways should be undertaken in such a manner that no containment of water is required, where possible.	Contractor	ECO / IECO	On-going	During construction phase
	3. The necessary authorisations should be obtained from DWS, should the containment of water be required.	Contractor	ECO / IECO / DWS	On-going	During construction phase
	4. All scour outlets (if any) will be provided with stone pitched or gabion mattress lined channels.	Contractor	ECO / IECO	On-going	During construction phase
	5. Visual inspections for the occurrence of erosion should be undertaken on a weekly basis.	Contractor / ECO	ECO / IECO	On-going	During construction phase
Handling of waste / Waste Management (Note that waste refers to all construction debris and domestic waste generated	1. The contractor is responsible for the removal of construction waste.	Contractor	ECO / IECO	On-going	During construction phase
	2. Suitable containers (weather and vermin proof) will be placed on site to collect all solid waste. These will be emptied regularly.	Contractor	ECO / IECO	On-going	During construction phase
	3. No littering is permitted. During the construction and operational phase the site will be maintained in a neat and tidy condition.	Contractor	ECO / IECO	On-going	During construction phase

Construction phase					
Objective	**Mitigation Measure**	**Executing Party**	**Monitoring Party**	**Timeframe**	**Project Stage**
due to construction activities.)	4. All solid waste produced will be disposed of at an authorized landfill site. Recyclable waste may also be sold to recycling contractors.	Contractor	ECO / IECO	On-going	During construction phase
	5. No dumping, burning or burying of waste will be undertaken on site.	Contractor	ECO / IECO	On-going	During construction phase
	6. All hazardous waste will be disposed of at an authorized hazardous landfill site. Recyclable hazardous waste may be re-used or sold to recycling contractors, where possible.	Contractor	ECO / IECO	On-going	During construction phase
	7. A waste management plan will be compiled and designed to ensure that adequate waste management activities are undertaken.	Contractor	ECO / IECO	On-going	During construction phase
	8. Areas used for waste storage and loading of materials should be lined and bund walls have to be erected to contain any spills that might occur.	Contractor	ECO / IECO	On-going	During construction phase
	9. Waybills providing evidence of correct disposal procedure must be provided for the ECO's inspection.	Contractor	ECO / IECO	On-going	During construction phase

Construction phase					
Objective	**Mitigation Measure**	**Executing Party**	**Monitoring Party**	**Timeframe**	**Project Stage**
	10. Waste classification should be undertaken.	Contractor	ECO / IECO	On-going	During construction phase
	11. Visual inspections for the occurrence of pollution should be undertaken daily.	Contractor	ECO / IECO	On-going	During construction phase
	12. Spills should be cleaned up immediately according to best practices	Contractor	ECO / IECO	On-going	During construction phase
	13. DWS should be notified of any spillage / pollution of water sources (groundwater and / or surface water) within 24 hours of occurrence	Contractor	ECO / IECO / DWS	On-going	During construction phase
	14. Record should be kept on site to indicate date of visual inspection, any spillages observed, and manner in which spill was treated.	Contractor / ECO	ECO / IECO / DWS	On-going	During construction phase
Health, safety and security	1. Site should be fenced / marked with danger tape, where possible.	Contractor	ECO / IECO	On-going	During construction phase
	2. The contractors will comply with the Occupational Health and Safety Act, National Building Regulations and any other national, regional or local regulations with regard to safety on site.	Contractor	ECO / IECO	On-going	During construction phase

Construction phase					
Objective	**Mitigation Measure**	**Executing Party**	**Monitoring Party**	**Timeframe**	**Project Stage**
	3. Construction contracts will include safety and security measures for staff.	Contractor	ECO / IECO	On-going	During construction phase
	4. Precautions to ensure that construction staff and sites are visible and proper PPE will be provided to all employees.	Contractor	ECO / IECO	On-going	During construction phase
	5. Suitable warning and information signage should be available at the storage facilities. In addition, telephone numbers of emergency services (including local firefighting services) must be posted conspicuously on site.	Contractor	ECO / IECO	On-going	During construction phase
	6. Employees should be made aware of the health risks associated with any hazardous substances / dangerous goods used or stored on site. This includes soil that was contaminated with oil or diesel, etc.	Contractor	ECO / IECO	On-going	During construction phase
	7. Employees should receive relevant safety training in handling of hazardous substances / dangerous goods associated with the proposed project.	Contractor	ECO / IECO	On-going	During construction phase
	8. Construction work within road reserves will accommodate road users as far as	Contractor	ECO / IECO	On-going	During construction

Construction phase					
Objective	**Mitigation Measure**	**Executing Party**	**Monitoring Party**	**Timeframe**	**Project Stage**
	possible. This includes the following: - Roads will be crossed in half widths at a time to minimise the impact on vehicular traffic, where possible. - Construction along and across existing roads will be executed in such a manner that both pedestrian and vehicular traffic is accommodated at all times. - The contractor will be required to maintain adequate access to all public and private property at all times. - Contractor will supply, erect and maintain road signs for all work areas conforming to the prescribed layout and requirement of the South African Road Traffic Signs Manual and other relevant notices.				phase
	9. Fire extinguishers will be available on site and in the construction camp (if any).	Contractor	ECO / IECO	On-going	During construction phase
	10. The contractor will be required to maintain adequate access to all public and private property at all times.	Contractor	ECO / IECO	On-going	During construction phase

Construction phase					
Objective	**Mitigation Measure**	**Executing Party**	**Monitoring Party**	**Timeframe**	**Project Stage**
	11. Speed limits of 20km/h will be enforced.	Contractor	ECO / IECO	On-going	During construction phase
	12. All relevant IAPs will be notified prior to any blasting activities	Contractor	ECO / IECO	On-going	During construction phase
	13. All relevant IAPs will be notified 24 hours prior to any known potential risks associated with the site and the activities to be undertaken on site (for example, possible downstream flooding as a result of removal of upstream diversion).	Contractor	ECO / IECO	On-going	During construction phase
	14. The necessary precautions with regard to road safety will be implemented for construction work within road crossings.	Contractor	ECO / IECO	On-going	During construction phase
	15. All injuries should be recorded.	Contractor	ECO / IECO	On-going	During construction phase
Heritage	1. In the case of the discovery of any heritage, archaeological or palaeontological significance, the work in the area will be stopped and reported to the archaeologist and SAHRA. Any construction activities in the nearby	Contractor	ECO / IECO / SAHRA	On-going	During construction phase

Construction phase					
Objective	**Mitigation Measure**	**Executing Party**	**Monitoring Party**	**Timeframe**	**Project Stage**
	vicinity may only commence after approval is obtained from SAHRA as well as the ECO.				
	2. Known heritage resources (if any) must be avoided as far as possible.	Contractor	ECO / IECO / SAHRA	On-going	During construction phase
	3. Employees should be encouraged and informed of the need to be on the look-out for potential fossils / buried archaeological material.	Contractor	ECO / IECO / SAHRA	On-going	During construction phase
	4. In the case of the discovery of any stone tools or other archaeological or paleontological material, the work in the immediate vicinity should temporarily cease and reported to the archaeologist and SAHRA. Should any human remains be exposed, the archaeologist as well as the local SAPS should be notified.	Applicant / Contractor	ECO / IECO / SAHRA	On-going	During construction phase
	5. If any evidence of archaeological sites or remains (e.g. remnants of stone-made structures, indigenous ceramics, bones, stone artefacts, ostrich eggshell fragments, charcoal and ash concentrations), fossils or other	Applicant / Contractor	ECO / IECO / SAHRA	On-going	During construction phase

Construction phase					
Objective	**Mitigation Measure**	**Executing Party**	**Monitoring Party**	**Timeframe**	**Project Stage**
	categories of heritage resources are found during the proposed development, SAHRA APM Unit (Tel: 021 462 5402) must be alerted. If unmarked human burials are uncovered, the SAHRA Burial Grounds and Graves (BGG) Unit (Tel: 012 320 8490), must be alerted immediately. A professional archaeologist or paleontologist, depending on the nature of the finds, must be contracted as soon as possible to inspect the findings. If the newly discovered heritage resources prove to be of archaeological or palaeontological significance, a Phase 2 rescue operation may be required subject to permits issued by SAHRA.				
	6. Appropriate measures should be undertaken by the ECO until the archaeologist / SAPS visits the site. This should include the following: - Site should be fenced with 'danger tape'	Applicant / Contractor	ECO / IECO / SAHRA	On-going	During construction phase

Construction phase					
Objective	**Mitigation Measure**	**Executing Party**	**Monitoring Party**	**Timeframe**	**Project Stage**
	- Position of finding should be recorded - Depth of finding should be recorded - Digital image of the finding should be taken - No information on the findings may be made public without the consent of the archaeologist / SAPS.				
	7. Construction activities in the area may only continue after approval from the archaeologist and SAHRA.	Applicant / Contractor / ECO	ECO / IECO / SAHRA	On-going	During construction phase
Noise and dust control	1. Construction activities will be limited to normal daytime hours, where possible	Contractor	ECO / IECO	On-going	During construction phase
	2. Noise levels will be kept as low as possible during the construction phase in order not to disturb adjacent landowners	Contractor	ECO / IECO	On-going	
	3. Proper mitigation measures will be implemented to limit noise (e.g. the installation of silencers, where required).	Contractor	ECO / IECO	On-going	During construction phase
	4. Proper mitigation measures will be implemented to limit the formation of dust (e.g. wetting of construction area, when required).	Contractor	ECO / IECO	On-going	During construction phase

Construction phase					
Objective	**Mitigation Measure**	**Executing Party**	**Monitoring Party**	**Timeframe**	**Project Stage**
	5. The speed of the construction vehicles will be limited to avoid dangerous conditions, the formation of dust and the excessive deterioration of roads being used.	Contractor	ECO / IECO	On-going	During construction phase
Handling and Storage of materials	1. All chemicals used during the development, including fuel, will be stored in a proper storeroom or protected area to prevent pollution.	Contractor	ECO / IECO	On-going	During construction phase
	2. Vehicles will be serviced at designated areas. No oil, diesel or other chemicals may be spilled or discharged anywhere.	Contractor	ECO / IECO	On-going	During construction phase
	3. Where applicable, the contractors will ensure that all relevant national, regional and local legislation regarding storage, transport, use and disposal of petroleum, chemical, harmful or hazardous substances and materials are adhered to, where necessary.	Contractor	ECO / IECO	On-going	During construction phase
	4. Cement and concrete mixing, if applicable, will only take place within the construction site. No concrete will be mixed directly on the ground.	Contractor	ECO / IECO	On-going	During construction phase

Construction phase					
Objective	**Mitigation Measure**	**Executing Party**	**Monitoring Party**	**Timeframe**	**Project Stage**
	5. All environmental problems occurring on the site such as chemical spillage, wasteful water disposal, etc. will be reported to the ECO. The ECO should implement best practices to rectify the impacts thereof on the environment.	Contractor	ECO / IECO	On-going	During construction phase
	6. Spill response equipment must be available during the handling and loading of hazardous waste (if any).	Contractor	ECO / IECO	On-going	During construction phase
	7. Hazardous substances are to be stored in bunded areas.	Contractor	ECO / IECO	On-going	During construction phase
	8. Bund walls will have a capacity of at least 110% of the total capacity of the stored volume.	Contractor	ECO / IECO	On-going	During construction phase
	9. No oil, diesel or other chemicals may be spilled or discharged anywhere and contact with bare soil should be avoided at all cost.	Contractor	ECO / IECO	On-going	During construction phase
	10. Drip trays will be used during the servicing of vehicles as well as the transfer of chemicals / substances from transportation vehicles.	Contractor	ECO / IECO	On-going	During construction phase

Construction phase					
Objective	**Mitigation Measure**	**Executing Party**	**Monitoring Party**	**Timeframe**	**Project Stage**
	11. A monitoring system should be implemented to determine the occurrence (if any) of any fuel / oil spillages / untreated sewer.	Contractor	ECO / IECO	On-going	During construction phase
	12. The necessary mitigation measures should be implemented immediately, should any leakages / spills be detected.	Contractor	ECO / IECO	On-going	During construction phase
	13. Material stockpiles, such as bricks and pipes, must be stable and well secured to avoid collapse and possible injury	Contractor	ECO / IECO	On-going	During construction phase
	14. Material and Safety Data Sheets (MSDSs) should be readily available on site for all hazardous materials. MSDSs should additionally include information on ecological impacts and measures to minimise negative environmental impacts during accidental releases or escapes.	Contractor	ECO / IECO	On-going	During construction phase
	15. Storage areas should be kept clean and free from any accumulation of combustible matter (such as paper) and any possible source of ignition should be removed.	Contractor	ECO / IECO	On-going	During construction phase

Construction phase					
Objective	**Mitigation Measure**	**Executing Party**	**Monitoring Party**	**Timeframe**	**Project Stage**
Hazardous waste management	1. Hazardous wastes must be separated from general wastes, stored within secondary containment in appropriate containers.	Contractor	ECO / IECO	On-going	During construction phase
	2. Proper storage facilities for the storage of hazardous / dangerous goods must be provided to prevent the migration of spillage into the soil and or groundwater.	Contractor	ECO / IECO	On-going	During construction phase
	3. Certificates / waybills of hazardous waste disposals are to be available on request as well as auditing purposes. This includes the removal of soil contaminated with hydrocarbons.	Contractor	ECO / IECO	On-going	During construction phase
	4. Storage of hazardous substances and refuelling areas are to be bunded with an impermeable liner to protect groundwater quality and must comply with the relevant SANS codes.	Contractor	ECO / IECO	On-going	During construction phase
	5. Areas used for the storage of hazardous materials are to be clearly indicated as such.	Contractor	ECO / IECO	On-going	During construction phase
Hazardous and Flammable	1. All deliveries (especially of hazardous nature) must be supervised.	Contractor	ECO / IECO	On-going	During construction phase

Construction phase					
Objective	**Mitigation Measure**	**Executing Party**	**Monitoring Party**	**Timeframe**	**Project Stage**
materials: Delivery	2. Subcontractors and delivery companies should be informed of the delivery procedures and made aware of restrictions as to where materials may be stored.	Contractor	ECO / IECO	On-going	During construction phase
	3. Loads must be secured to prevent spillage during transportation thereof.	Contractor	ECO / IECO	On-going	During construction phase
	4. Hazardous substances are to be transported in sealed drums or bags	Contractor	ECO / IECO	On-going	During construction phase
Hazardous and Flammable materials: Cement and / or concrete mixing	1. Limit cement and concrete mixing to single sites, where possible.	Contractor	ECO / IECO	On-going	During construction phase
	2. No mixing allowed directly onto the ground.	Contractor	ECO / IECO	On-going	During construction phase
	3. All visible remains of excess material will be treated as hazardous waste.	Contractor	ECO / IECO	On-going	During construction phase
	4. Solid concrete waste may be treated as inert construction rubble. However, wet cement and liquid slurry and cement powder must be treated as hazardous waste	Contractor	ECO / IECO	On-going	During construction phase

Construction phase					
Objective	**Mitigation Measure**	**Executing Party**	**Monitoring Party**	**Timeframe**	**Project Stage**
Hazardous and Flammable materials: Gas Storage	1. All combustible materials are to be store at least 3 m from any gas storage areas. In case of any flammable or any other gas storage areas, open flames, welding and cutting operations, smoking, etc. shall be prohibited in or near the storage area.	Contractor / ECO	ECO / IECO	On-going	During construction phase
	2. No gas will be delivered until the site is registered with local Fire Safety.	Contractor / ECO	ECO / IECO	On-going	During construction phase
	3. Cylinders should always be stored in a well-ventilated area away from spark, flames or any source of heat or ignition.	Contractor / ECO	ECO / IECO	On-going	During construction phase
	4. Cylinders should always be handled, stored, used and transported in an upright position. It should not be dropped, dragged or rolled on their sides or allowed to skid. Cylinders that are too large to be carried shall be tilted and rolled on the rims of their foot rings or bases.	Contractor / ECO	ECO / IECO	On-going	During construction phase
	5. Valves should be kept properly closed.	Contractor / ECO	ECO / IECO	On-going	During construction phase

Construction phase					
Objective	**Mitigation Measure**	**Executing Party**	**Monitoring Party**	**Timeframe**	**Project Stage**
Hazardous and Flammable materials: Chemicals, Grease and Oil Storage	1. Storage areas must be bunded and hard surfaced in order to protect groundwater quality.	Contractor	ECO / IECO	On-going	During construction phase
	2. Compliance with SANS codes and hazardous substances bylaws should be adhered to.	Contractor	ECO / IECO	On-going	During construction phase
	3. All lids must be properly sealed / closed to prevent Volatile Organic Compounds (VOCs) and other potentially harmful gaseous compounds from escaping.	Contractor	ECO / IECO	On-going	During construction phase
Hazardous and Flammable materials: Hydrocarbon spillages	1. Spill kits are to be made permanently available at areas which have the potential to be subjected to spillage of hazardous substances and dangerous goods.	Contractor	ECO / IECO	On-going	During construction phase
	2. Remediation of spillages must be conducted immediately and closed out within 24 hours.	Contractor	ECO / IECO / DWS / DESTEA	On-going	During construction phase
	3. No waste water or waste will be disposed of into the surrounding environment at any time. Water collected in bunded areas must be collected in containers and disposed of as hazardous waste.	Contractor	ECO / IECO	On-going	During construction phase

Construction phase					
Objective	**Mitigation Measure**	**Executing Party**	**Monitoring Party**	**Timeframe**	**Project Stage**
	4. Machinery will be kept maintained in line with manufactures specifications to minimise the risk of hydrocarbon spillages.	Contractor	ECO / IECO	On-going	During construction phase
	5. An incident reporting system will be implemented in order to ensure incidents, where spillages has occurred, are closed out and appropriate measures are taken to prevent further incidents.	Contractor	ECO / IECO	On-going	During construction phase
	6. Incidents must be reported to DWS within 24 hours.	Contractor	ECO / IECO / DWS	On-going	During construction phase
	7. Contaminated soil must be disposed of in a hazardous materials skip and removed to a licensed hazardous landfill facility by a licensed contractor.	Contractor	ECO / IECO	On-going	During construction phase

Operational Phase					
Objective	**Mitigation Measure**	**Executing Party**	**Monitoring Party**	**Timeframe**	**Project Stage**
This phase consists of the operation of the abstraction works. Maintenance and repair will be undertaken on the infrastructure when necessary.	1. Proper erosion mitigation measures should be implemented.	Applicant	DESTEA / DWS	On-going	During operational phase
	2. Visual inspections should be undertaken at least every 6 months to investigate the occurrence of sedimentation and erosion.	Applicant	DESTEA / DWS	On-going	During operational phase
	3. Soil erosion occurrences will be attended to immediately.	Applicant	DESTEA / DWS	On-going	During operational phase
	4. Establishment of alien vegetation will be monitored and alien species will be removed by hand or by an approved chemical before gestation thereof.	Applicant	DESTEA / DWS	On-going	During operational phase
	5. Stabilise the banks of the watercourses, where necessary.	Applicant	DESTEA / DWS	On-going	During operational phase

Decommissioning Phase					
Objective	**Mitigation Measure**	**Executing Party**	**Monitoring Party**	**Timeframe**	**Project Stage**
It is not anticipated that the proposed project will cease in the nearby future. However, if decommissioning is decided upon, a rehabilitation plan will be developed and submitted for approval. The end-use of the area will be kept in mind during the compilation of the rehabilitation plan. Activities	1. Temporary structures and office sites (if any) will be dismantled and removed after completion of the construction phase of the project.	Contractor	ECO / IECO	On-going	During construction phase
	2. All waste, equipment, materials, etc. used during construction will be cleared from the site. The contractors will ensure that the site is cleared and rehabilitated to the satisfaction of the ECO.	Contractor / ECO	ECO / IECO	On-going	During construction phase
	3. An alien plant control and monitoring programme will be implemented.	Contractor	ECO / IECO	On-going	During construction phase
	4. Sedimentation and Erosion Control Measures will be implemented.	Contractor	ECO / IECO	On-going	During construction phase
	5. The establishment of natural occurring vegetation will be encouraged at disturbed areas. Re-vegetation of disturbed areas will be undertaken with site indigenous species.	Contractor	ECO / IECO	On-going	During construction phase
	6. Hydro-seeding will be implemented if the establishment of natural occurring vegetation does not occur within	Contractor / ECO	ECO / IECO	On-going	During construction phase

Decommissioning Phase					
Objective	**Mitigation Measure**	**Executing Party**	**Monitoring Party**	**Timeframe**	**Project Stage**
associated with the decommissioning phase will be limited to the rehabilitation of areas disturbed during the construction phase. All disturbed areas will be rehabilitated according to best practices. A rehabilitation plan will be developed, if it is decided to decommission the abstraction works and	reasonable time.				
	7. After completion of the construction phase, a waterway monitoring program will be initiated that ensure that all are adequately rehabilitated.	Contractor	ECO / IECO	On-going	During construction phase
	8. Temporary concrete surfaces (if any) will be removed and compacted areas ripped.	Contractor	ECO / IECO	On-going	During construction phase
	9. Establishment of extensive alien species will be monitored.	Contractor	ECO / IECO	On-going	During construction phase

Decommissioning Phase					
Objective	**Mitigation Measure**	**Executing Party**	**Monitoring Party**	**Timeframe**	**Project Stage**
associated infrastructure before the cessation of the operation aspects of the proposed project. The rehabilitation plan will include management and mitigation measures to be implemented during the decommissioning of the project					

No-Go Option					
Objective	**Mitigation Measure**	**Executing Party**	**Monitoring Party**	**Timeframe**	**Project Stage**
Keeping the status quo - not construct the abstraction works. This will reduce the functionality of the Senekal Bulk Water Supply System. Therefore, the no-go option is not seen as a feasible and / or reasonable alternative	1. Erosion control measures are to be implemented	Applicant	DESTEA / DWS	On-going	N/A

APPENDIX H

Details of EAP and
EAP Declaration

To be attached to fBAR

APPENDIX I

Specialist Declaration

To be attached to fBAR

- Archaeologist
- Ecologist

APPENDIX J

Additional information

APPENDIX J_1

Confirmation from Kai !Garib Local Municipality

N/A, as the applicant is the said municipality.

APPENDIX J_2

Title Deed Document

To be attached to fBAR