



**DRAFT BASIC ASSESSMENT FOR
THE PROPOSED WATER PIPE
REPLACEMENT IN HAMBERG, CITY
OF JOHANNESBURG, GAUTENG
PROVINCE.**

GDARD REFERENCE NO.: New Application

DATE: April 2019



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Basic Assessment Report in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended, and the Environmental Impact Assessment Regulations, 2014 (Version 1)

Kindly note that:

1. This **Basic Assessment Report** is the standard report required by GDARD in terms of the EIA Regulations, 2014.
2. This application form is current as of 8 December 2014. It is the responsibility of the EAP to ascertain whether subsequent versions of the form have been published or produced by the competent authority.
3. **A draft Basic Assessment Report must be submitted, for purposes of comments within a period of thirty (30) days, to all State Departments administering a law relating to a matter likely to be affected by the activity to be undertaken.**
4. **A draft Basic Assessment Report (1 hard copy and two CD's) must be submitted, for purposes of comments within a period of thirty (30) days, to a Competent Authority empowered in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended to consider and decide on the application.**
5. Five (5) copies (3 hard copies and 2 CDs-PDF) of the final report and attachments must be handed in at offices of the relevant competent authority, as detailed below.
6. 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.
7. Selected boxes must be indicated by a cross and, when the form is completed electronically, must also be highlighted.
8. An incomplete report may lead to an application for environmental authorisation being refused.
9. **Any report that does not contain a titled and dated full colour large scale layout plan of the proposed activities including a coherent legend, overlain with the sensitivities found on site may lead to an application for environmental authorisation being refused.**
10. 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 application for environmental authorisation being refused.
11. No faxed or e-mailed reports will be accepted. Only hand delivered or posted applications will be accepted.
12. Unless protected by law, and clearly indicated as such, all information filled in on this application will become public information on receipt by the competent authority. The applicant/EAP must provide any interested and affected party with the information contained in this application on request, during any stage of the application process.
13. Although pre-application meeting with the Competent Authority is optional, applicants are advised to have these meetings prior to submission of application to seek guidance from the Competent Authority.

DEPARTMENTAL DETAILS

Gauteng Department of Agriculture and Rural Development
Attention: Administrative Unit of the of the Environmental Affairs Branch
P.O. Box 8769
Johannesburg
2000

Administrative Unit of the of the Environmental Affairs Branch
Ground floor Diamond Building
11 Diagonal Street, Johannesburg

Administrative Unit telephone number: (011) 240 3377
Department central telephone number: (011) 240 2500

(For official use only)

NEAS Reference Number:						
File Reference Number:						
Application Number:						
Date Received:						

If this BAR has not been submitted within 90 days of receipt of the application by the competent authority and permission was not requested to submit within 140 days, please indicate the reasons for not submitting within time frame.

N/A – This is a Draft Basic Assessment Report

Is a closure plan applicable for this application and has it been included in this report?

NO

if not, state reasons for not including the closure plan.

Decommissioning and closure phase has not been considered as part of this application as the end use of the site and required decommissioning activities are not known at this time. In addition, the current environmental baseline conditions may change overtime; it is therefore not possible to predict the potential environmental impacts. In addition, it is unlikely that decommissioning will be contemplated due to the nature of the development. However, closure and decommissioning would require a separate EIA process. If decommissioning is considered in future, the developer/ license holder will undertake the required actions by applying for decommissioning.

Has a draft report for this application been submitted to a competent authority and all State Departments administering a law relating to a matter likely to be affected as a result of this activity?

YES

Is a list of the State Departments referred to above attached to this report including their full contact details and contact person?

YES

If no, state reasons for not attaching the list.

[REDACTED]

Have State Departments including the competent authority commented?

N/A

If no, why?

The Report is currently in the Draft (BAR) phase and is being released to the public and state departments for review and comments. Comments received during this phase will be included in the Final Basic Assessment Report.

I. PROJECT DETAILS

Report Title	:	Basic Assessment Report
Report Status	:	Draft
Review Period	:	23 April 2019 – 27 May 2019
Project Title	:	The Proposed Water Pipe Replacement in Hamberg, City of Johannesburg, Gauteng Province.
Applicant	:	Johannesburg Water SOC Ltd
Environmental Consultant	:	Envirolution Consulting (Pty) Ltd
GDARD Reference No.:	:	New Application

II. DOCUMENT CONTROL

PREPARED BY:

Sameera Ismail

(MA Environmental Management)

REVIEWED BY:



Karthigesan Govender

(Pr.Sci.Nat. No: 400049/12)

III. DECLARATION

Envirovolution Consulting Pty Ltd was contracted by Johannesburg Water SOC Ltd (hereinafter referred to as Johannesburg Water) as the independent environmental consultant to undertake the Environmental Basic Assessment process for the proposed project. Envirovolution Consulting (Pty) Ltd is not a subsidiary of, or affiliated to Johannesburg Water. Furthermore, Envirovolution Consulting does not have any interests in secondary developments that may arise out of the authorisation of the proposed project.

IV. APPLICANT DETAILS

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V. ENVIRONMENTAL ASSESSMENT PRACTITIONER (EAP)'s DETAILS

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E-mail:	gesan@envirovolution.co.za	Fax:	(086) 162 62 22
EAP Qualifications	BSc. Honours Botany		
EAP Registrations/ Associations	Registered with the South African Council for Natural Scientific Professions (No: 400049/12)		

Details of the EAP's expertise to carry out Basic Assessment procedures

The EAPs from Envirovolution Consulting who are responsible for this project are (refer to **Appendix I** for CVs):

- Gesan Govender – The principle Environmental Assessment Practitioner (EAP) for this project is a registered Professional Natural Scientist and holds an Honours Degree in Botany. He has over 18 years of experience within the field of environmental management. His key focus is on strategic environmental assessment and advice; management and co-ordination of environmental projects, which includes integration of environmental studies and environmental processes into larger engineering-based projects and ensuring compliance to legislation and guidelines; compliance reporting; the identification of environmental management solutions and mitigation/risk minimising measures; and strategy and guideline development. He is currently responsible for the project management of EIAs for several diverse projects across the country.

- Sameera Ismail – The principle author of this Basic Assessment Report, holds a MA Environmental Management degree from the University of Johannesburg. She has 2 years of experience consulting in the environmental field. Her key focus is on strategic environmental assessment and advice; management and co-ordination of environmental projects, which includes integration of environmental studies and environmental processes into larger engineering-based projects and ensuring compliance to legislation and guidelines; the identification of environmental management solutions and mitigation/risk minimising measures; and Water Use License processes. Sameera is currently a Project Manager and Environmental Consultant at Envirolution Consulting Pty Ltd.

VI. SPECIALIST'S DETAILS

Name of Specialist	Title of specialist report/ s as attached in Appendix G	Date issued
Limosella Consulting	Wetland/Riparian Delineation and Functional Assessment	February 2019
	General Wetland Rehabilitation and Monitoring Plan	February 2019
Barbara Kasl	Terrestrial Fauna Impact Assessment and Management Plan	February 2019
Dimela Eco Consulting	Vegetation Assessment	February 2019
J A van Schalkwyk	Heritage Impact Assessment	February 2019

ABBREVIATIONS

BAR	Basic Assessment Report
CoJ	City of Johannesburg
EAP	Environmental Assessment Practitioner
EMPr	Environmental Management Programme
EIA	Environmental Impact Assessment
GDARD	Gauteng Department of Agriculture and Rural Development
GN	Government Notice
HIA	Heritage Impact Assessment
I&AP's	Interested and Affected Parties
IDP	Integrated Development Plan
NEMA	National Environmental Management Act (No. 107 of 1998) (as amended)
NHRA	National Heritage Resources Act (No. 25 of 1999)
NWA	National Water Act (No 36 of 1998)
SAHRA	South African Heritage Resources Agency
SDF	Spatial Development Framework
SMP	Stormwater Management Plan
WULA	Water Use License Application

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SECTION A: ACTIVITY INFORMATION

1. PROPOSAL OR DEVELOPMENT DESCRIPTION

1.1 Project Title

The proposed water pipe replacement in Hamberg, City of Johannesburg, Gauteng Province.

1.2 Background

The pipe replacement programme within the City of Johannesburg is one of the key strategies aimed at combating water losses and improving the level of service to the residents of the City by reducing pipe bursts. In order to create an objective pipe replacement priority list, Johannesburg Water Infrastructure Planning Section commissioned a desktop study to identify areas requiring urgent pipe replacement interventions. From the investigation and assessment, ageing is the main contributing factor to the frequent pipe bursts as most of the pipes have Remaining Useful Life (RUL) of less than 3 years.

A project charter was compiled by Johannesburg Water Infrastructure Planning Section requesting for the replacement of the existing Asbestos Cement (AC) and steel pipes with uPVC on the road reserve and HDPE on the road crossings within the identified streets in Hamberg.

1.3 Project Description

The proposed scope of works includes the following:

- Replacement of about 5934m of 100mm Ø steel pipe with 110m Ø High Impact uPVC, 994m length of 150mm Ø AC pipe with 160mm Ø High Impact uPVC and 132m length of 200mm Ø AC pipe with 200mm Ø High Impact uPVC.
- Installation of HDPE pipes using the Horizontal Directional Drilling (HDD) method on major road crossings.
- Location, exposing and protection of existing services.
- Connecting the new network to the existing network.
- Reinstatement of surfaces to original condition.
- Replacement of approximately 118 domestic water meters.
- Replacement of all below ground domestic water meters.

The project entails the replacement of the existing reticulation water line of 50mm, 100mm, 150mm and 200mm diameters along Potgieter, Weibak, Going, Haman, Elloff, Berg, Von Brands, Eeufees, Oxley, Bree, Skinner, Wandel, Bannie, Spies, Boles, Steyn, Hamburg and Transport Avenue streets.

The following streets were identified for pipe replacement and the estimated pipe lengths thereof:

Table 1: Proposed streets due for pipe replacement

Street Names	Pipe Lengths to be Replaced	Existing Pipe (mm)	Proposed Pipes
Potgieter Street	230	50	110mm Ø uPVC Class 16
Potgieter Street	25	60	110mm Ø uPVC Class 16
Potgieter Street	67	75	110mm Ø uPVC Class 16
Potgieter Street	132	200	200mm Ø uPVC Class 16
Weibalk Street	186	100	110mm Ø uPVC Class 16
Weibalk Street	182	50	110mm Ø uPVC Class 16
Weibalk Street	122	75	110mm Ø uPVC Class 16
Going Street	126	50	110mm Ø uPVC Class 16
Haman/ Elloff	128	75	110mm Ø uPVC Class 16
Haman/ Elloff	764	150	160mm Ø uPVC Class 16
Berg Street	796	110	110mm Ø uPVC Class 16
Von Brands Street	546	110	110mm Ø uPVC Class 16
Euufees Street	247	100	110mm Ø uPVC Class 16
Euufees Street	224	110	110mm Ø uPVC Class 16
Oxley Street	202	75	110mm Ø uPVC Class 16
Oxley Street	10	160	160mm Ø uPVC Class 16
Oxley Street	302	150	160mm Ø uPVC Class 16
Bree Street	386	75	110mm Ø uPVC Class 16
Skinner Street	590	50	110mm Ø uPVC Class 16
Wandel Street	704	100	110mm Ø uPVC Class 16
Wandel Street	185	50	110mm Ø uPVC Class 16
Barry Street	96	75	110mm Ø uPVC Class 16
Barry Street	181	50	110mm Ø uPVC Class 16
Barry Street	41	110	110mm Ø uPVC Class 16
Spies Street	114	75	110mm Ø uPVC Class 16
Boles Street	355	75	110mm Ø uPVC Class 16
Steyn Street	201	75	110mm Ø uPVC Class 16
Hamberg Road	265	100	110mm Ø uPVC Class 16
Hamberg Road	177	150	160mm Ø uPVC Class 16
Transport Avenue	56	100	110mm Ø uPVC Class 16
Total Length			7 640

The recorded bursts are causing water supply disruptions, water losses as well as a strain on resources both financial and human. A minimum pipe cover of 1000mm will be maintained in gravel and tarred road whereas in road reserves and other areas the cover will be reduced to 800mm. to avoid disturbance to the flow of traffic, Horizontal Directional Drilling (HDD) will be used to install pipes on the major road crossings.

The primary objectives of this project are to:

- Provide better services to the consumers.
- Reduce water interruptions.
- Reduce workload.
- Reduce unaccounted water.

It is important to note, a river is running parallel to Eeufees and Oxley Streets flowing to the eastern direction of the suburb, with crosses to the 1:100 year floodline on Barrie and Steyn Streets. The pipeline will have five connection points into the existing water network. There are existing pipes (which require upgrading and replacement) crossing the buffer as well as the 1:100 year floodline of the river. The areas requiring upgrades and replacement within crossing and within close proximity to the watercourse, its buffers and the 1:100 year floodline are being applied for in this application. The areas outside the watercourse do not trigger any listed activities and are thus not being applied for in this application.

Limitations

- Almost all the entrances to the properties are paved with either brick paving, concrete paving and to a smaller scale asphalt surfaces. The removal and the replacement of paved surfaces were allowed for on the Bill of Quantities. Along the other parts of the road reserves most surfaces are covered with grass which will also be reinstated.

Proposed Route

Water mains will be laid 1m away from the existing pipe where there is sufficient space in the road reserve. The existing pipe will be decommissioned after the new pipe is laid and will be left in the ground. Affected residents will be notified with regard to the project implementation and where access if needed.

Labour Intensive Construction

The proposed works to be constructed utilizing labour intensive construction methods include:

- Clearing and grubbing of the site.
- Mixing, transporting, placing and finishing of small concrete works.

- Excavation, spreading, processing and compaction.
- Spoiling of all materials within distances not exceeding 20m.
- Transportation of earthworks for distances not exceeding 20m.
- Removal of oversized materials.
- Cleaning and tidying up of the site.

1.4 Listed Activities:

In terms of Sections 24(2) and 24D of the National Environmental Management Act (Act No. 107 of 1998), as amended, and as read with the Environmental Impact Assessment (EIA) Regulations of Government Notices R 982 to 985 (as amended), the development will trigger a Basic Assessment process as per the following activities:

Table 2: Listed Activities

Listed activities	Description of project activity that triggers listed activity
<p>Activity 19 of Listing Notice 1 (GNR 983)</p> <p>The infilling or depositing of any material of more than 10 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 10 cubic metres from a watercourse.</p>	<p>The proposed project will result in infilling and depositing of more than 10m³ into a watercourse. In addition the excavation and removal of soil materials of more than 10m³ from a watercourse will take place during the construction of the pipeline.</p>
<p>Activity 12 of Listing Notice 3 (GNR R985)</p> <p>The clearance of an area of 300 square metres or more of indigenous vegetation</p> <p>(b) In Gauteng:</p> <p>ii. Within Critical Biodiversity Areas or Ecological Support Areas identified in the Gauteng Conservation Plan or bioregional plans.</p>	<p>The clearance of an area of 300 square metres or more of indigenous vegetation is required for the proposed pipeline within Critical Biodiversity Areas/ Ecological Support Areas identified in the Gauteng Conservation Plan.</p>
<p>Activity 14 of Listing Notice 3 (GNR 985)</p> <p>The development of:-</p> <p>(ii) infrastructure or structures with a physical footprint of 10 square metres or more; where such development occurs –</p> <p>a) within a watercourse;</p> <p>c) In Gauteng:</p> <p>iv. sites identified as Critical Biodiversity Areas (CBAs)</p>	<p>The proposed pipeline will be constructed over an area of 10 square meters or more within a watercourse on areas identified as Important and Ecological Support Areas by the Gauteng Conservation Plan.</p>

and Ecological Support Areas (ESAs) Gauteng Conservation Plan or in bioregional plans.

1.5 Locality of study site

The proposed works are to take place along Potgieter, Weibak, Going, Haman, Elloff, Berg, Von Brands, Euefees, Oxley, Bree, Skinner, Wandel, Bannie, Spies, Boles, Steyn, Hamburg and Transport Avenue streets. The project is situated in the suburb of Hmaberg, approximately 30km west of Johannesburg CBD, Gauteng Province under Region C of the City of Johannesburg. The central GPS coordinates of the site are 26°10'13.49"S; 27°53'21.60"E. Refer to Figure 1 below for the locality map.

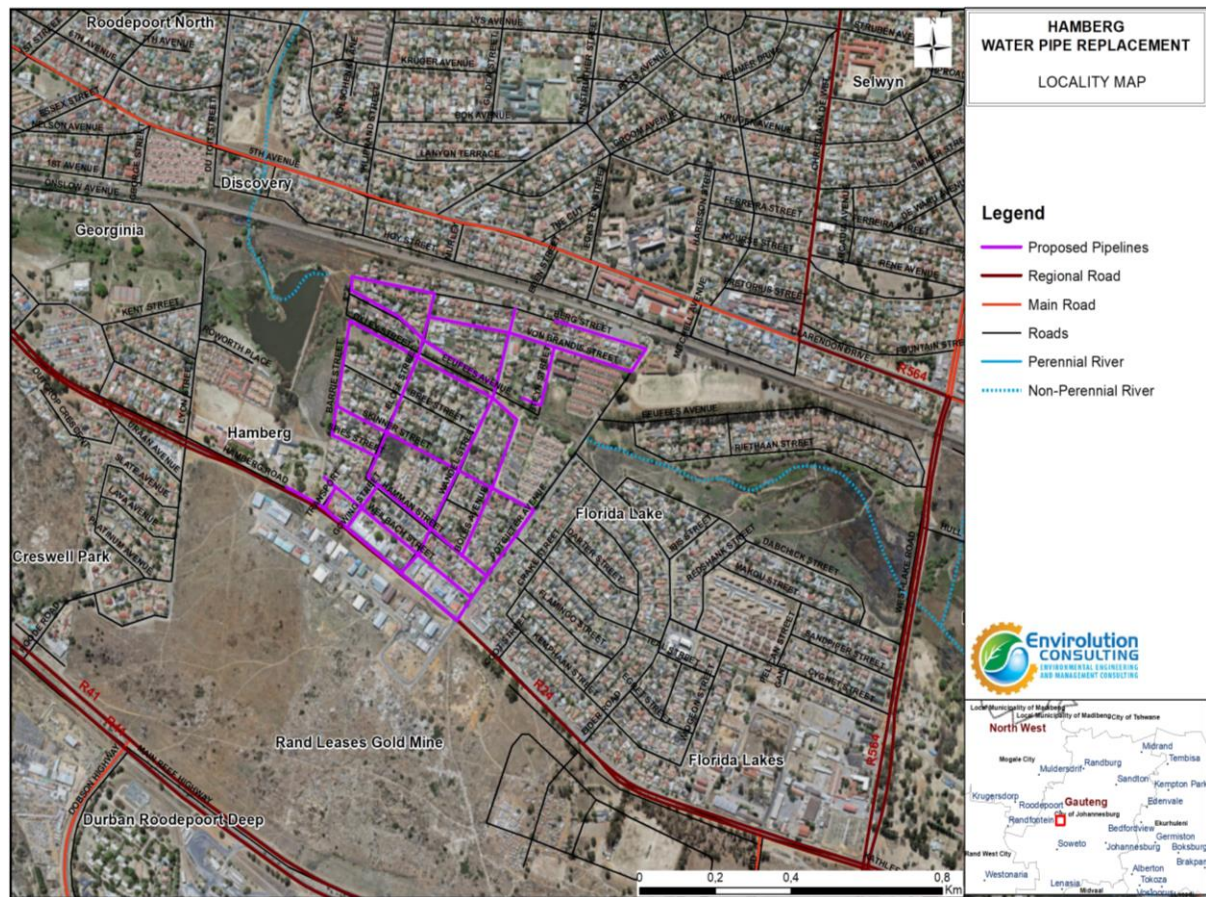


Figure 1: Locality Map

Select the appropriate box

The application is for an upgrade of an existing development

The application is for a new development

Other, specify

Does the activity also require any authorisation other than NEMA EIA authorisation?

 YES

If yes, describe the legislation and the Competent Authority administering such legislation

The pipeline will be crossing a watercourse. It is for such reasons that a Water Use License application process has to be undertaken for the development. According to the National Water Act (NWA), 1998 (Act No. 36 of 1998), the proposed development requires a Water Use License as per the following regulations:

- Section 21(c): impeding or diverting the flow of water in a watercourse; and
- Section 21 (i): altering the bed, banks, course or characteristics of a watercourse.

The Competent Authority responsible for issuing Water Use Licenses is the Department of Water and Sanitation.

If yes, have you applied for the authorisation(s)?

YES	
-----	--

If yes, have you received approval(s)? (attach in appropriate appendix)

	NO
--	----

A Water Use License Application is currently being uploaded onto the DWS eWULAAS portal. Refer to **Appendix F** for proof thereof. Impacts on the watercourse have been assessed through the Basic Assessment process (**Appendix G1** – Wetland Report). The following reports/ studies as outlined below will be required to be uploaded with the Water Use License Application:

- Basic Assessment Report;
- Wetland Assessment Report;
- Risk Assessment; and
- General Wetland Rehabilitation and Monitoring Plan.

The nature and characteristic of the proposed project may not commence without an environmental authorisation from the competent authority, Gauteng Department of Agriculture and Rural Development (GDARD). It is for this reason that a Basic Assessment Process is being conducted and to ensure that:

- The potential environmental impacts associated with the proposed project are taken into consideration;
- Public Participation is conducted i.e. to afford any Interested and/ or Affected Parties (I&APs) sufficient opportunity to provide comments; and
- Sufficient information is provided to the competent authority for an informed record of decision.

2. 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:

Table 3: Applicable Legislation, Policies and/or Guidelines

Title of legislation, policy or guideline (Promulgation Date)	Applicable Requirements	Administering Authority	Description of compliance
National Environmental Management Act (Act No. 107 of 1998)	<p>NEMA requires, inter alia, that:</p> <ul style="list-style-type: none"> ○ Development must be socially, environmentally, and economically sustainable. ○ Disturbance of ecosystems and loss of biological diversity are avoided, or, where they cannot be altogether avoided, are minimised and remedied. ○ A risk-averse and cautious approach is applied, which takes into account the limits of current knowledge about the consequences of decisions and actions. <p>EIA Regulations have been promulgated in terms of Chapter 5. Activities which may not commence without an environmental authorisation are identified within these Regulations.</p> <p>In terms of S24(1) of NEMA, the potential impact on the environment associated with these listed activities must be considered, investigated, assessed and reported on to the competent authority charged by NEMA with granting of the relevant environmental authorisation.</p>	National Department of Environmental Affairs Gauteng Department of Agriculture and Rural Development	The Basic Assessment is undertaken in accordance with the requirements of Government Notice R982 of December 2014, as required in terms of the National Environmental Management: Waste Act, 2008 (No. 59 of 2008).
National Environmental Management Act (Act No. 107 of 1998)	A project proponent is required to consider a project holistically and to consider the cumulative effect of potential impacts.	National Department of Environmental Affairs	While no permitting or licensing requirements arise directly, the holistic consideration of the potential impacts of the

Title of legislation, policy or guideline (Promulgation Date)	Applicable Requirements	Administering Authority	Description of compliance
	In terms of the Duty of Care provision in S28(1) the project proponent must ensure that reasonable measures are taken throughout the life cycle of this project to ensure that any pollution or degradation of the environment associated with a project is avoided, stopped or minimised.	Gauteng Department of Agriculture and Rural Development	proposed project has found application in the EIA Phase. The implementation of mitigation measures is included as part of the Project EMP and will continue to apply throughout the life cycle of the project.
National Environmental Management: Biodiversity Act 2004 (Act 10 of 2004)	This Act provides management and conservation of South Africa's biodiversity within the framework of the National Environmental Management Act 107 of 1998; the protection of species and ecosystems that warrant national protection and the sustainable use of indigenous biological resources.	Department of Environmental Affairs (DEA)	While no permitting or licensing requirements arise from this legislation, this Act will find application during the construction phase of the project in proper management of the sensitive area (wetland) identified on site.
National Environmental Management: Waste Act (Act No. 59 of 2008)	The NEMA: WA came into effect on the on 1st July 2009. Section 20 of the Environment Conservation Act 73 of 1989, under which waste management was previously governed, was repealed. In general, the act seeks to ensure that people are aware of the impact of waste on their health wellbeing and the environment, and in the process giving effect to Section 24 of the constitution, in ensuring an environment that is not harmful to health and wellbeing.	Department of Environmental Affairs (DEA) National Department of Environmental Affairs – lead authority for regulating hazardous waste. Provincial Environmental Department – for regulating general waste	No waste license activities are applicable to this project. The developer will however be required to store and manage waste in accordance with the requirements of this Act and associated Standards.
National Environmental	S18, S19 and S20 of the Act allow certain areas to be declared	National Department of	While no permitting or licensing

Title of legislation, policy or guideline (Promulgation Date)	Applicable Requirements	Administering Authority	Description of compliance
Management: Air Quality Act (Act No. 39 of 2004)	<p>and managed as "priority areas".</p> <p>The Act provides that an air quality officer may require any person to submit an atmospheric impact report if there is reasonable suspicion that the person has failed to comply with the Act.</p> <p>Dust Control Regulation Control Regulations, R. No. 827 of 1 November 2013.</p>	Environmental Affairs	<p>requirements arise from this legislation for the site, this Act will find application during the construction phase of the project.</p> <p>The implementation of dust mitigation measures are included as part of the project EMPr and will continue to apply throughout the life cycle of the project.</p> <p>Dust control regulations promulgated in November 2013 may require the implementation of a dust management plan</p>
National Heritage Resource Act, 1999 (Act No. 25 of 1999)	<p>Section 38 states that Heritage Impact Assessments (HIAs) are required for certain kinds of development including the construction of a road, exceeding 300m in length.</p> <p>In accordance with the NHRA, an independent heritage consultant is to conduct a cultural heritage assessment to determine any impact on any sites, features or objects of cultural heritage significance. If none are identified, any archaeological sites or graves to be exposed during construction work must immediately be reported to a heritage practitioner so that an investigation and evaluation of the finds can be made.</p> <p>If a permit is required as per section 34 of the NHRA, no works are to commence before the permit is obtained.</p>	<p>South African Heritage Resources Association (SAHRA)</p> <p>The Provincial Heritage Resources Authority Gauteng (PHRAG)</p>	Should any heritage sites be unearthed during excavations, a permit would be required to be obtained from SAHRA.
Promotion of Access to Information Act, 2000 (Act	Legislation that allows the public access to information about activities that influence their well-being and to make contributions	Department of Environmental Affairs	No permitting is required. The act finds applicability during the public participation

Title of legislation, policy or guideline (Promulgation Date)	Applicable Requirements	Administering Authority	Description of compliance
No 2 of 2000):	to decision making.		process phase of the Basic Assessment process.
Occupational Health and Safety Act No. 85 of 1993:	The Occupational Health and Safety Act provides for the health and safety of persons at work and for the health and safety of persons in connection with the use of plant and machinery; the protection of persons other than persons at work, against hazards to health and safety arising out of or in connection with the activities of persons at work.	Department of Labour	While no permitting or licensing requirements arise from this legislation, this Act will find application during the construction phase of the project. Health and safety precautions measures must be put in place for the construction crew and the general public. E.g. Protection of workers on site through provision of Personal Protective Equipment's; Training and other health and safety amenities.

3. ALTERNATIVES

Describe the proposal and alternatives that are considered in this application. Alternatives should include a consideration of all possible means by which the purpose and need of the proposed activity could be accomplished. The determination of whether the 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.

The no-go option must in all cases be included in the assessment phase as the baseline against which the impacts of the other alternatives are assessed. **Do not include the no go option into the alternative table below.**

Note: 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.

Provide a description of the alternatives considered

Table 4: Description of Alternatives

No.	Alternative type, either alternative: site on property, properties, activity, design, technology, energy, operational or other(provide details of “other”)	Description
1.	Site Alternatives	There are no site alternatives as the water pipe infrastructure in Hamberg itself requires rehabilitation and upgrading given the current state.
2.	Method Alternatives	<p>Method Alternative 1: Construction of uPVC pipe using open trenching method (Preferred)</p> <p>Open trench excavation is the traditional and most common method of water pipe construction, repair or replacement. Open trench excavation entails excavating down to lay the new pipe, then backfilling the trench.</p> <p>Advantages</p> <ul style="list-style-type: none"> • Installing a new pipeline that satisfies the requirements required. • Larger cross sectional area to work in. • Suitable method for severely damaged underground pipelines. • Unlike the trenchless method that requires a “holding” pipe for passage, the traditional open cut excavation method can easily install a new pipe. • This method of construction is very labour intensive and will encourage local labourers to participate in the project since it is not necessarily a specialised method of construction.

		<ul style="list-style-type: none"> • Project duration is longer, therefore, supporting the community for a longer period of time. • Skills transfer from skilled labourers (i.e. those already working for the Contractor can impart knowledge and experience to the local labourers). <p>Disadvantages</p> <ul style="list-style-type: none"> • More excavation is required than compared to trenchless methods. • May require removal of street and sidewalk pavement which increases expense of the repair. • Noise, vibration and emission pollution from the construction site and traffic deviation.
		<p>Method Alternative 2: Construction of HDPE pipes using Horizontal Directional Drilling (HDD) method</p> <p>Horizontal Directional Drilling (HDD), sometimes called directional boring, is a steerable trenchless method of installing underground pipes in a shallow arc along a prescribed bore path by using a surface-launched drilling rig. This method is used when trenching or excavating is not practical.</p> <p>Advantage</p> <ul style="list-style-type: none"> • The direct costs of trenchless technology can be significantly less than the direct cost of open cut excavation. • Trenchless technologies can reduce construction related CO₂ emissions by 90%, reducing the carbon footprint on the environment. • Trenchless technology improves quality of life issues for neighbourhoods by minimizing both noise and air pollution. • Elimination of surface excavation minimizes traffic disruption.

		<ul style="list-style-type: none">• A less exposed work site reduces dangers to both workers and the community.• Less damage to the environment and existing structures. <p>Disadvantages</p> <ul style="list-style-type: none">• Requires advanced/ modern technology.• Potential Barite Sag – includes losing the circulation, having poor logging tools, having no well control, difficulty in cementing or sticking pipes.
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Existing Pipes

AC pipes – Asbestos is a naturally occurring mineral which is commonly used within building material. Asbestos consists of long, thin fibres which allows for thermal insulation. Asbestos has a natural fire-resistant property. Compared to plastic and wood, asbestos has higher longevity. Asbestos is also inexpensive as a result of it occurring naturally, yet has the same durability as other cement additives. Asbestos is a very good additive with cement which adds strength to the material; increasing the lifespan.

However, asbestos is hazardous to human health. Long-term exposure to asbestos fibres is linked to causing asbestosis, lung cancer and mesothelioma. As a result thereof, any asbestos cement showing signs of wear requires immediate attention as fiber is released into the potable water. There are high costs associated with the repairing or replacing of AC pipes. AC pipes are bulky, heavy and require careful transportation and handling. They are also rigid thus requiring uniform and leveled bed for laying.

Steel pipes are traditionally used for conveying water because of their hollow structure associated with strength, durability and elasticity. Steel pipes are beneficially used where high resistance is required to withstand internal and external pressure. Even under the toughest condition, steel pipes can be used because of the elasticity, ductility and freedom from brittleness. Steel pipes are usually manufactured from materials with yield stresses varying within 210 to 350 MPa and tensile strength varying within 340 to 650 MPa. As a result, steel pipes have the ability of handling stresses, uneven bending, wrong alignment or variation in temperature. Steel pipes are more beneficial where complicated bending and longitudinal stresses are involved. Steel pipes are more beneficial where high resistance is required against shock or vibration. Fluctuating pressure involved in static head or shock pressure arising from water hammer can be withstood by the use of steel pipes.

Carbon steel pipes with carbon contents are subjected to rusting and consequently, corrosion. Due to atmospheric oxidation, ferric oxide is formed that separates away from the surface as flakes. This surface corrosion is arrested in stainless steel pipes or in galvanized steel pipes. In stainless steel pipes, chromium is alloyed with steel and the surface coating of chromium oxide arrests further corrosion. Similarly, galvanized steel pipes, with surface coating of zinc checks rusting of steel pipes when exposed to the atmospheric condition.

After rinsing out rusted surface in acid, steel pipes are dipped into a bath of molten zinc and kept there for some time. The internal as well as the external surface of the pipes get a thinner film of zinc and such pipes are called galvanized pipes. The galvanized steel pipes of various nominal bores are used as water pipes by laying them underground for supply of water for public utility. Because of the anti-corrosive quality of zinc, water does not react with steel and rusting and corrosion are checked. These underground water supply systems facilitated by galvanized steel pipes last longer with almost zero maintenance cost. A benefit associated with the use of steel pipes is the saving on maintenance costs for the local government.

Proposed Pipes

HDPE is a thermoplastic pipe made from material that can be melted and reformed. It is rugged, flexible, and durable. It has outstanding chemical and environmental stress crack resistance. Benefits include corrosion resistance; fatigue resistance; extended service life; leak-free joints; adaptability; and their eco-friendly nature.

Corrosion Resistance – Corrosion is one of the most costly problems associated with metal piping systems. It occurs both inside and outside the pipe and affects hydraulic efficiency. Unlike traditional metal infrastructure products, HDPE pipe does not rust, rot or corrode. It is resistant to biological growth. This means an extended service life and long term cost savings.

Fatigue Resistance – HDPE pipes are flexible and ductile, not rigid. It has outstanding resistance to fatigue. Unlike other plastic pipes, it is designed and pressure rated to handle the kind of occasional and recurring surge events that are common in water distribution systems. In many instances, this allows for the utilization of a thinner wall HDPE pipe as compared to other types of plastic piping.

Extended Service Life – HDPE pipes are a safe and durable. The service life of HDPE is estimated to be between 50 to 100 years, depending on application, design and installation.

Leak-Free Joints – Traditional infrastructure piping is joined with bell and spigot or mechanical type joints and all acknowledge a specified leakage factor. Leaking pipes are extremely costly. HDPE piping systems can be joined with heat fusion to produce permanent leak free joints. Heat fusion involves the heating of two HDPE surfaces then bringing them together to form a permanent, monolithic, leak-free system.

Adaptability – In addition to joining HDPE pipes with heat fusion, HDPE pipes can also be joined with Stab or Mechanical Fittings. HDPE pipes can easily be transitioned to and from non-HDPE piping systems utilizing Mechanical Joint adapters (MJ's), Stab fittings and Mechanical and Flanged Connections.

Eco-Friendly – In addition to the physical benefits, HDPE is recognized for its minimal impact on the environment as it takes less energy to manufacture HDPE than non-plastic pipes; it is lightweight and is often more cost effective to transport than metal pipes; the flexibility of HDPE means fewer fittings are required; less leakages; it does not emit potentially hazardous levels of toxins into the air during production, during fusion or into the ground or water during use; and they can be recycled back into non-pressure piping applications.

uPVC – Regular PVC (polyvinyl chloride) is a common, strong but lightweight plastic used in construction. It is made softer and more flexible by the addition of plasticizers. If no plasticizers are added, it is known as uPVC. uPVC pipes are corrosion resistant; they do not corrode and are completely unaffected by acids, alkalies and electrolytic corrosion from any source. It is virtually unaffected by water. Its light weight makes it easy to install. Pipes made from PVC are only about 1/5 the weight of an equivalent cast iron pipe and from 1/3 to 1/4 the weight for an equivalent cement pipe, thus reducing the cost of transportation and installation tremendously. It

has an excellent hydraulic characteristic; they have an extremely smooth bore due to which frictional losses are minimized and flow rates are higher than other pipe materials. It is non-flammable; they are self-extinguishing and do not support combustion. They are flexible and resistant to breakage. They are not liable to beam failure and can thus more readily accommodate axial deflection due to the solid movement or due to settlement of structures to which the pipe is connected. It is resistant to biological growth as a result of the smoothness of the inner surface of the pipes. It prevents algae, bacteria and fungi formation within the pipe. These pipes are also long-lasting.

Preferred Alternative

The preferred construction method is the installation of uPVC pipes using open trenching method (this method makes up 90% of the proposed works). However, the HDD method will only be performed on road crossings as well as places where damaging other infrastructure on the pipeline route will be avoided.

Due to the crossing of a stream at certain sections using a hanging pipe, a steel or Glass Reinforced Pipes (GRP) shall be used supported by concrete columns and gabions. There will be minor excavations at the stream banks due to construction of columns and installation of gabions.

In the event that no alternative(s) has/have been provided, a motivation must be included in the table below.



4. PHYSICAL SIZE OF THE ACTIVITY

Indicate the total physical size (footprint) of the proposal as well as alternatives. Footprints are to include all new infrastructure (roads, services etc.), impermeable surfaces and landscaped areas:

Proposed activity (Alternative 1 – preferred)
 Alternative 2
 Alternative 3

Size of the activity:

m²

or, for linear activities:

Proposed activity (Method Alternative 1)
 Alternative 2
 Alternative 3

Length of the activity:

	7640m
	7640m

m/km

Indicate the size of the site(s) or servitudes (within which the above footprints will occur):

Proposed activity
 Alternative

Size of the site/servitude:

	2m

Ha/m²

Servitude

In accordance with the Johannesburg Water Design Standards, the minimum acceptable width for pipes not exceeding 200mm diameter is 2 meters. For large diameter pipes as well as for trenches deeper than 1.5m, the servitude width shall be calculated using the following formula:

$$ws = \Theta + 2d$$

Where, ws is the servitude width, Θ is the pipe diameter and d is the trench depth

In this instance the pipes on the layout plans are not greater than 200mm in diameter; therefore, the width of the servitude is 2 meters.

5. SITE ACCESS

Does ready access to the site exist, or is access directly from an existing road?

YES

If NO, what is the distance over which a new access road will be built

Describe the type of access road planned:

Maximum use of existing roads shall be made.

Include the position of the access road on the site plan. (if the access road is to traverse a sensitive feature the impact thereof must be included in the assessment).

PLEASE NOTE: Points 6 to 8 of Section A must be duplicated where relevant for alternatives

Section A 6-8 has been duplicated XXXXXXXXXX Number of times

(only complete when applicable)

6. LAYOUT OR ROUTE PLAN

A detailed site or route (for linear activities) plan(s) must be prepared for each alternative site or alternative activity. It must be attached to this document. The site or route plans must indicate the following:

- the layout plan is printed in colour and is overlaid with a sensitivity map (if applicable);
- layout plan is of acceptable paper size and scale, e.g.
 - A4 size for activities with development footprint of 10sqm to 5 hectares;
 - A3 size for activities with development footprint of > 5 hectares to 20 hectares;
 - A2 size for activities with development footprint of >20 hectares to 50 hectares);
 - A1 size for activities with development footprint of >50 hectares);
- The following should serve as a guide for scale issues on the layout plan:
 - A0 = 1: 500
 - A1 = 1: 1000
 - A2 = 1: 2000
 - A3 = 1: 4000
 - A4 = 1: 8000 (±10 000)
- shape files` of the activity must be included in the electronic submission on the CD's;
- the property boundaries and Surveyor General numbers of all the properties within 50m of the site;
- the exact position of each element of the activity as well as any other structures on the site;
- the position of services, including electricity supply cables (indicate above or underground), water supply pipelines, boreholes, sewage pipelines, septic tanks, storm water infrastructure;
- servitudes indicating the purpose of the servitude;
- sensitive environmental elements on and within 100m of the site or sites (including the relevant buffers as prescribed by the competent authority) including (but not limited thereto):
 - Rivers and wetlands;
 - the 1:100 and 1:50 year flood line;
 - ridges;
 - cultural and historical features;
 - areas with indigenous vegetation (even if it is degraded or infested with alien species);
- Where a watercourse is located on the site at least one cross section of the water course must be included (to allow the position of the relevant buffer from the bank to be clearly indicated)

FOR LOCALITY MAP (NOTE THIS IS ALSO INCLUDED IN THE APPLICATION FORM REQUIREMENTS)

- the scale of locality map must be 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 locality map and all other maps must be in colour;
- locality map must show property boundaries and numbers within 100m of the site, and for poultry and/or piggery, locality map must show properties within 500m and prevailing or predominant wind direction;
- for gentle slopes the 1m contour intervals must be indicated on the map and whenever the slope of the site exceeds 1:10, the 500mm contours must be indicated on the map;
- areas with indigenous vegetation (even if it is degraded or infested with alien species);
- locality map must show exact position of development site or sites;

- locality map showing and identifying (if possible) public and access roads; and
- the current land use as well as the land use zoning of each of the properties adjoining the site or sites.

The Locality Map along with Sensitivity Maps for the proposed development are attached within **Appendix A.**

7. SITE PHOTOGRAPHS

Colour photographs from the center 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 the appropriate Appendix. It should be supplemented with additional photographs of relevant features on the site, where applicable.

Site photographs are attached as **Appendix B.**

8. FACILITY ILLUSTRATION

A detailed illustration of the activity must be provided at a scale of 1:200 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 to be attached in the appropriate Appendix.

The conceptual layout of the proposed replacement and upgrade is included as **Appendix C.**

SECTION B: DESCRIPTION OF RECEIVING ENVIRONMENT

Note: Complete Section B for the proposal and alternative(s) (if necessary)

Instructions for completion of Section B for linear activities

- 1) For linear activities (pipelines etc) it may be necessary to complete Section B for each section of the site that has a significantly different environment.
- 2) Indicate on a plan(s) the different environments identified
- 3) Complete Section B for each of the above areas identified
- 4) Attach to this form in a chronological order
- 5) Each copy of Section B must clearly indicate the corresponding sections of the route at the top of the next page.

Section B has been duplicated for sections of the times route

Instructions for completion of Section B for location/route alternatives

- 1) For each location/route alternative identified the entire Section B needs to be completed
- 2) Each alternative location/route needs to be clearly indicated at the top of the next page
- 3) Attach the above documents in a chronological order

Section B has been duplicated for location/route alternatives (complete only when appropriate)

Instructions for completion of Section B when both location/route alternatives and linear activities are applicable for the application

Section B is to be completed and attachments order in the following way

- All significantly different environments identified for Alternative 1 is to be completed and attached in a chronological order; then
- All significantly different environments identified for Alternative 2 is to be completed and attached chronological order, etc.

Section B - Section of Route (complete only when appropriate for above)

Section B – Location/route Alternative No. (complete only when appropriate for above)

It is worth noting that both method alternatives are proposed in the same receiving environment and therefore will be assessed together as impacts will be similar. It is for this reason that the section will not be duplicated.

1. PROPERTY DESCRIPTION

Property description:

(Including Physical Address and Farm name, portion etc.)

The proposed water pipeline network in Hamberg are to be constructed mostly along the road reserves and on the following properties:

Farm/Erf Number:	Portion:	SG Codes:
Hamberg, Erf 189	8	T0IQ01490000018900008
Hamberg, Erf 189	9	T0IQ01490000018900009
Hamberg, Erf 198	33	T0IQ01490000019800033
Discovery Ext 9, Erf 1172	0	T0IQ00840000177200000

2. ACTIVITY POSITION

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 decimal degrees. The degrees should have at least six decimals to ensure adequate accuracy. The projection that must be used in all cases is the WGS84 spheroid in a national or local projection.

Proposed Activity:

Latitude (S):

Longitude (E):

Centre point of the activity

26°10'14.23"S

27°53'21.17"E

In the case of linear activities:

Proposed Activity:

Latitude (S):

Longitude (E):

- Starting point of the activity
- Middle point of the activity
- End point of the activity

For route alternatives that are longer than 500m, please provide co-ordinates taken every 250 meters along the route and attached in the appropriate Appendix. Please find attached in

Addendum of route alternatives attached [REDACTED]

The 21 digit Surveyor General code of each cadastral land parcel

Farm/Erf Number:	Portion:	SG Codes:
Hamberg, Erf 189	8	T0IQ01490000018900008
Hamberg, Erf 189	9	T0IQ01490000018900009
Hamberg, Erf 198	33	T0IQ01490000019800033
Discovery Ext 9, Erf 1172	0	T0IQ00840000177200000

3. GRADIENT OF THE SITE

Indicate the general gradient of the site.

The project area slopes south-westward towards the stream.

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
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4. LOCATION IN LANDSCAPE

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

Ridgeline	Plateau	Side slope of hill/ridge	Valley	Plain	Undulating plain/low hills	River front
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5. GROUNDWATER, SOIL AND GEOLOGICAL STABILITY OF THE SITE

a) Is the site located on any of the following?

- Shallow water table (less than 1.5m deep)
- Dolomite, sinkhole or doline areas
- Seasonally wet soils (often close to water bodies)
- Unstable rocky slopes or steep slopes with loose soil
- Dispersive soils (soils that dissolve in water)
- Soils with high clay content (clay fraction more than 40%)
- Any other unstable soil or geological feature
- An area sensitive to erosion

YES	
	NO
YES	
	NO
YES	
	NO
	NO
YES	

(Information in respect of the above will often be available at the planning sections of local authorities. Where it exists, the 1:50 000 scale Regional Geotechnical Maps prepared by Geological Survey may also be used).

b) are any caves located on the site(s) [] NO

If yes to above provide location details in terms of latitude and longitude and indicate location on site or route map(s)

Latitude (S): Longitude (E):

c) are any caves located within a 300m radius of the site(s) [] NO

If yes to above provide location details in terms of latitude and longitude and indicate location on site or route map(s)

Latitude (S): Longitude (E):

d) are any sinkholes located within a 300m radius of the site(s) [] NO

If yes to above provide location details in terms of latitude and longitude and indicate location on site or route map(s)

Latitude (S): Longitude (E):

If any of the answers to the above are “YES” or “unsure”, specialist input may be requested by the Department

Hydrology

The site is situated in the C22A Quaternary Catchment. In this catchment, the precipitation rate is considerably lower than the evaporation rate with a Mean Annual Precipitation (MAP) to Potential Evapotranspiration (PET) of

0.32 for Quaternary Catchment C22A. Consequently, wetlands in this area are sensitive to changes in regional hydrology, particularly where their catchment becomes transformed and the water available to sustain them becomes redirected.

Nine Water Management Areas (WMA) were established by, and their boundaries defined in Government Gazette Nr. 40279, dated 16 September 2016. The Quaternary Catchment C22A falls within the fifth WMA, the Vaal Major (West) and Marico. The major rivers that are located within this WMA include the Wilge-, Liebenbergsvlei-, Mooi-, Renoster-, Vals-, Sand-, Vet-, Harts-, Molopo and Vaal River.

The wetland associated with the study site does not form or flow into any major river sources in close proximity although it ultimately flows into the Klip River through a tributary. The Klip River eventually confluences with the Vaal River. This river of strategic importance is the third largest river in South Africa after the Orange River (2200 km long) and the Limpopo River (1750 km long) and was established as the main source of water for the great Witswatersrand area after the gold rush during the 19th Century.

Surface water spatial layers such as the National Freshwater Ecosystems Priority Areas (NFEPA) Wetland Types for South Africa and Gauteng Department of Agriculture and Rural Development (GDARD) were consulted for the presence of wetlands and rivers. This layer reflects one watercourse that runs through the study area. Refer to Figure 2: Hydrology Map. The wetland vegetation group of the study area is Mesic Highveld Grassland Group 3. The wetland map indicates the pipeline location in relation to the 30m and 500m buffers. Refer to Figure 3: Wetland Map.

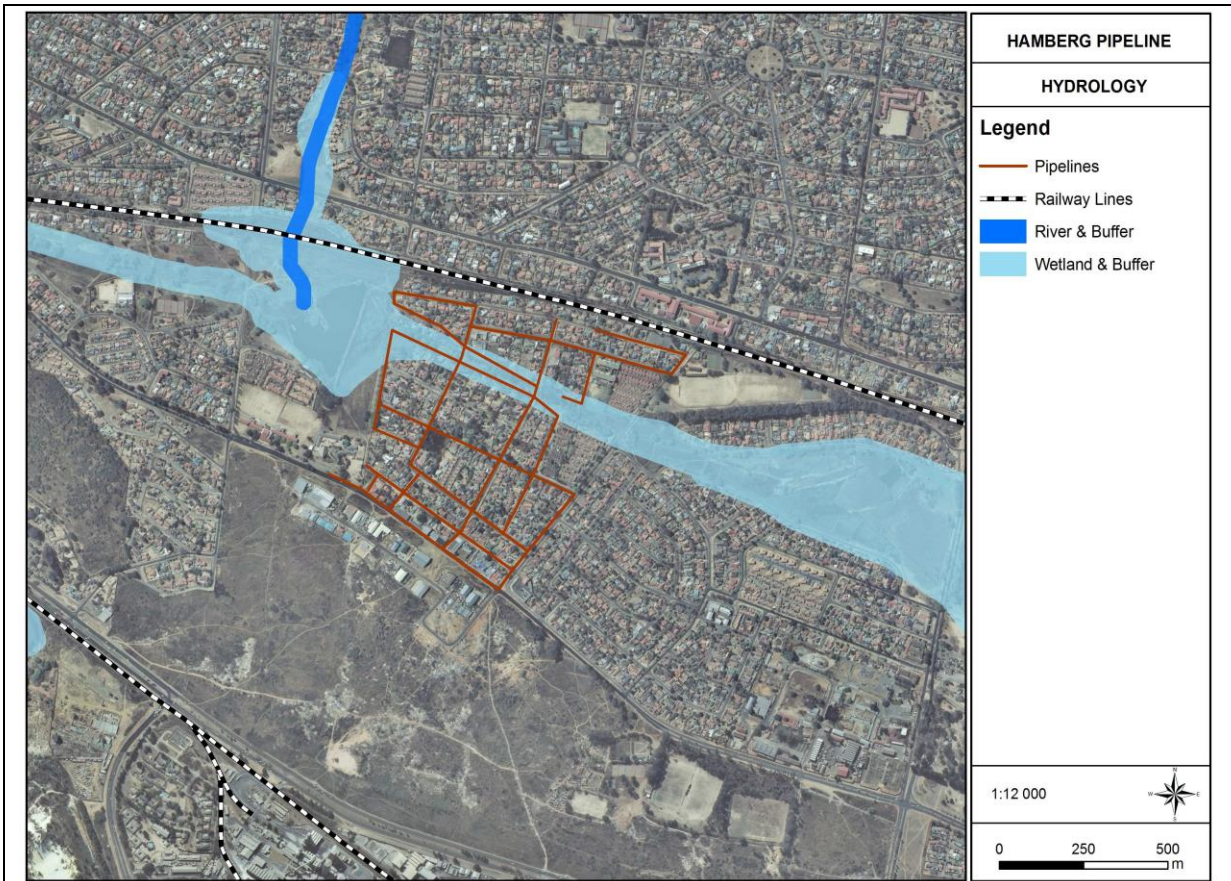


Figure 2: Hydrology Map

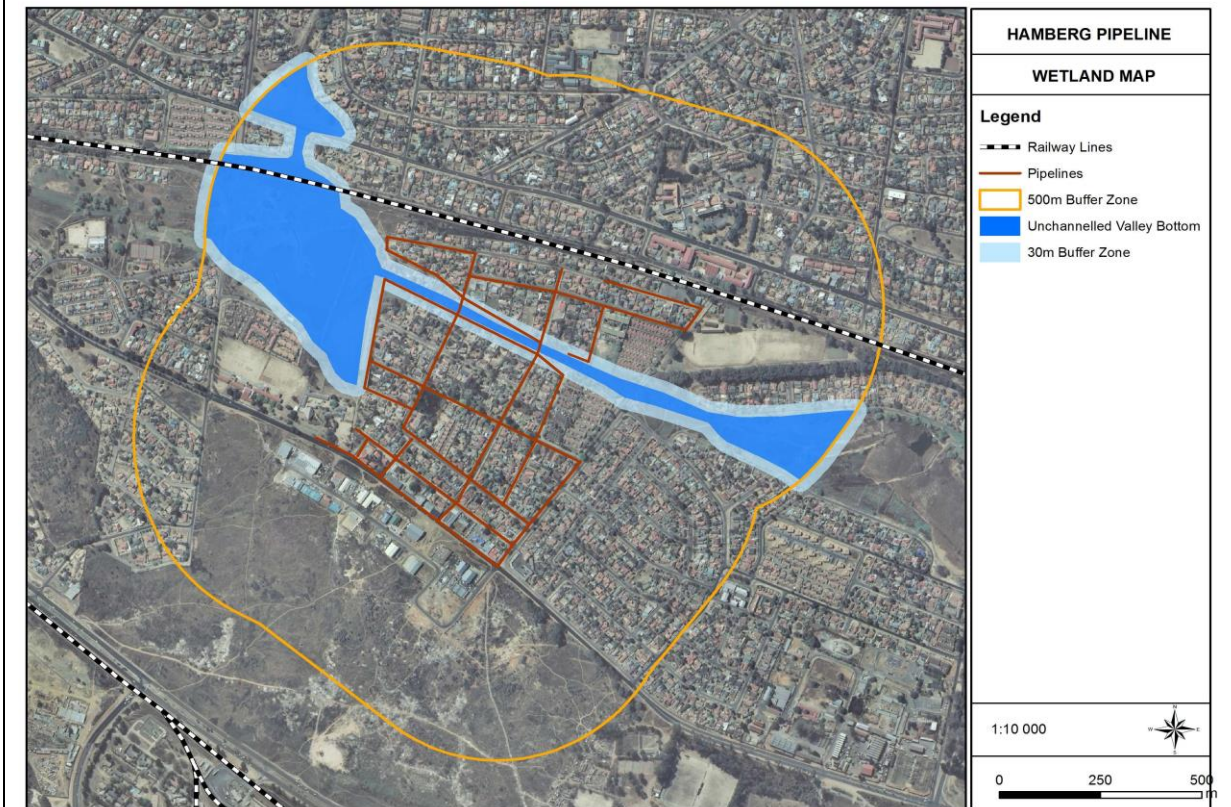


Figure 3: Wetland Map

The Present Ecological State (PES) score of 6.6 (**E – Low**) and the Ecological Importance and Sensitivity (EIS) score of 1.4 (**C – Moderate**) was calculated for the Unchannelled Valley Bottom Wetland. The Recommended Ecological Category (REC) score is **D**.

Geology and Soils

The Jeppestown Subgroup of the lower West Rand Group underlies the entire study site. The soil of the area is summarised in Table 5 and Figure 4 below.

Table 5: Soil of the study site

Soil Name	Description	Relation to wetlands
U – Majority of the study area	Unconsolidated/Urban Soil Usually considered a disturbed soil which no longer retains recognizable profiles following anthropogenic disturbance.	None
xHu26 – Small southern section of the study site	SOIL SERIES CLASS. Red apedal sandy loam/sandy clay loam of variable depth (300-1200mm), mesotrophic.	None



Figure 4: Soil of the study area and surroundings

Refer to **Appendix G1 – Wetland Assessment** for full report.

6. AGRICULTURE

Does the site have high potential agriculture as contemplated in the Gauteng Agricultural Potential Atlas (GAPA 4)? NO

Please note: The Department may request specialist input/studies in respect of the above.

7. GROUNDCOVER

To be noted that the location of all identified rare or endangered species or other elements should be accurately indicated on the site plan(s).

Indicate the types of groundcover present on the site and include the estimated percentage found on site

Natural veld - good condition % =	Natural veld with scattered aliens % = 5%	Natural veld with heavy alien infestation % = 5%	Veld dominated by alien species % =	Landscaped (vegetation) % = 5%
Sport field % =	Cultivated land % =	Paved surface (hard landscaping) % = 80%	Building or other structure % = 5%	Bare soil % =

Please note: The Department may request specialist input/studies depending on the nature of the groundcover and potential impact(s) of the proposed activity/ies.

Are there any rare or endangered flora or fauna species (including red list species) present on the site NO

If YES, specify and explain:



Are there any rare or endangered flora or fauna species (including red list species) present within a 200m (if within urban area as defined in the Regulations) or within 600m (if outside the urban area as defined in the Regulations) radius of the site. NO

If YES, specify and explain:



Are there any special or sensitive habitats or other natural features present on the site? YES

If YES, specify and explain:

Regional Vegetation

The vegetation that will be impacted on by the replacement pipeline was classified as modified from the reference state of Soweto Highveld Grassland. Small pockets of semi-natural vegetation remain, particularly along the western edge of the project area and east thereof. The vegetation associated with the watercourse that flows from west to east through the site was degraded and dominated by alien invasive plant species.

The vegetation and its sensitivity to the proposed pipeline route was classified as per the table below:

Table 6: Vegetation and its sensitivity

Broad vegetation community	Sensitivity to the proposed pipeline construction
Riparian vegetation, modified	medium
Moist grassland-modified	medium
Secondary grassland	low-medium
Modified grassland and lawns	low
Built-up areas	low

The vegetation along the route comprised mainly of modified vegetation and ranged from low to medium sensitivity to the pipeline replacement and ranged from moderately to severely modified. Watercourses should be regarded as high sensitivity, however, the vegetation of the watercourse and moist grasslands are degraded or modified and its sensitivity rating as medium is mainly due to its functional role, as well as the statutory protection of watercourses.

Although not listed in the historical records for the Quarter Degree Square (QDS), one species, classified as Declining in Gauteng (nationally classified as Least Concern) was recorded. This species, *Crinum cf bulbipsernum*, was found growing north of the watercourse, within modified and built-up land. The two individuals were found growing in front of a house where they were likely planted. If they cannot be conserved in situ, the plants should be removed, maintained in a good condition while construction takes place, and replanted to their original locality as part of rehabilitation.

From a vegetation perspective, the development could proceed provided that mitigation measures are implemented to limit the effect on vegetation and to ensure that the soils are successfully recolonised by indigenous vegetation post construction.

Listed Ecosystems

The National Environmental Management: Biodiversity Act (Act 10 of 2004) provides for the listing of threatened or protected ecosystems. These ecosystems are grouped into Critically Endangered-, Endangered-, Vulnerable- and Protected Ecosystems (Section 52(1) (a) of the National Environmental Management: Biodiversity Act (Government Gazette 34809, Government Notice 1002, 9 December 2011)). The proposed pipeline falls within the historical extent of the Soweto Highveld Grassland, which is a listed ecosystem. Soweto Highveld Grassland is classified as Vulnerable under criterion: A1 Irreversible loss of natural habitat. It is estimated that less than 60% of this ecosystems' original extent remains.

Gauteng Ridges

Ridges are protected environments within Gauteng. The term ridge refers to hills, koppies, mountains, kloofs and

gorges and/or a landscape type or topographic feature that is characterized by two or more of the following features: a crest, plateau, cliff or footslope. Many threatened species of plants and animals inhabit ridges. As such, the conservation of ridges in Gauteng will contribute significantly to the future persistence of these species. Ridges are thus of conservation concern and development within such areas are restricted, depending on the classification of each ridge. The Gauteng Development Guideline for Ridges classified ridges into four classes based on the percentage of the ridge that has been transformed. The northern extent of the pipeline traverses a transformed (mostly built-up) footprint of a 4 ridge (Figure 5).

Class 4 ridge: as per the definition, 65% or more of the surface area of a class 4 ridge has been converted to urban development, quarries and/or alien vegetation. The guidelines for a class 4 ridge include:

- a) The consolidation of properties on Class 4 ridges is supported.
- b) The subdivision of property on Class 4 ridges will not be permitted in areas of the ridge where the remaining contiguous extent of natural habitat is 4ha or more.

Further development activities will not be permitted in areas of the ridge where the remaining contiguous extent of natural habitat is 4ha or more. It must be noted that all areas traversed by the pipeline has already been modified.

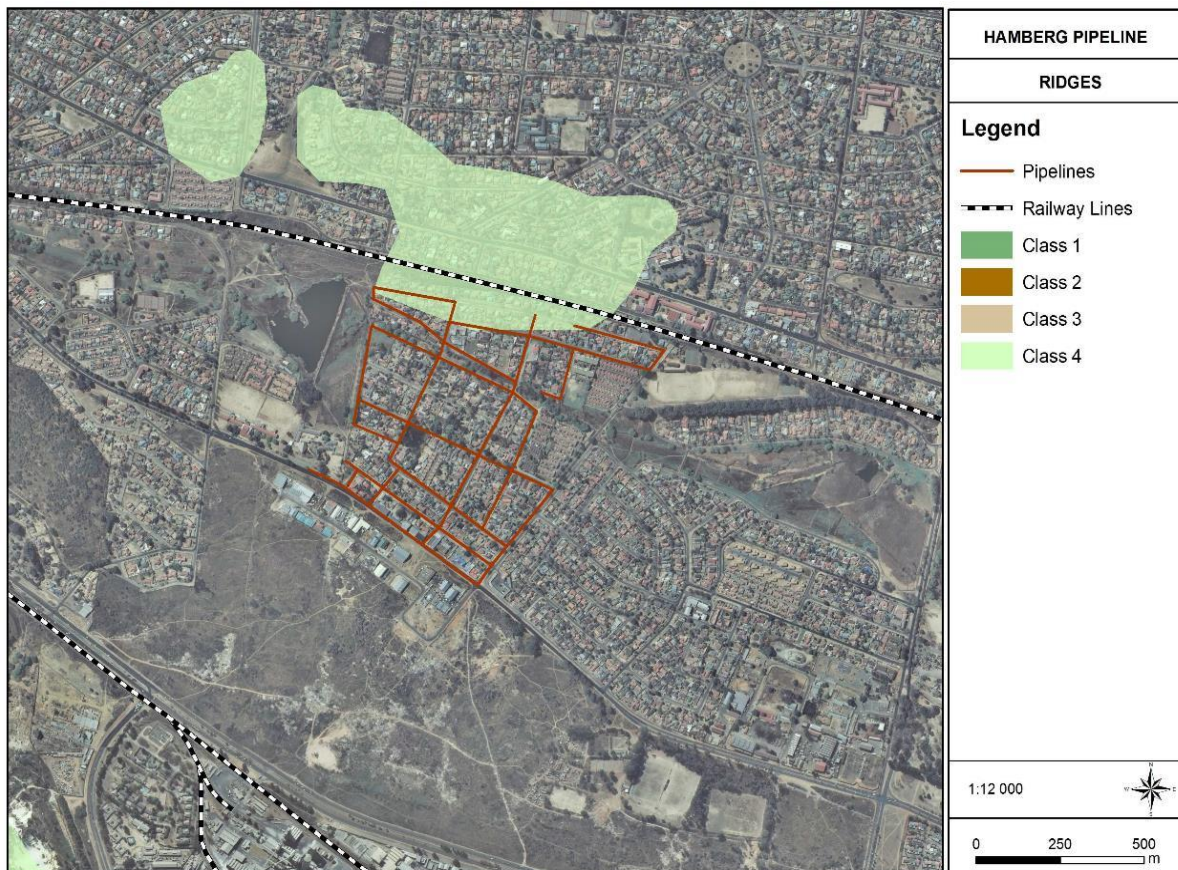


Figure 5: Class 4 ridges north and south of the project area

Vegetation Survey Overview

Vegetation associations identified during this study are based on the overall similarity in vegetation structure, species composition, and abiotic features such as moistness and rocky areas.

The vegetation that will be impacted on by the replacement pipeline was classified as modified from the reference state of Soweto Highveld Grassland. Small pockets of semi-natural vegetation remain, particularly along the western edge of the project area and east thereof. Vegetation was mapped within 25 meters on either side of the pipeline route and geographically represented in Figure 6. The vegetation was grouped as follows:

1. Vegetation associated with watercourses
 - Modified riparian vegetation; and
 - Moist grassland (mainly east of the project area)
2. Secondary grassland;
3. Modified, mowed grassland and lawn; and
4. No natural habitat (built-up areas including residential lawns).

Each broad vegetation grouping is discussed below and geographically represented in Figure 6. The areas mapped include built-up areas that contain infrastructure, roads and residential areas which is not discussed further.

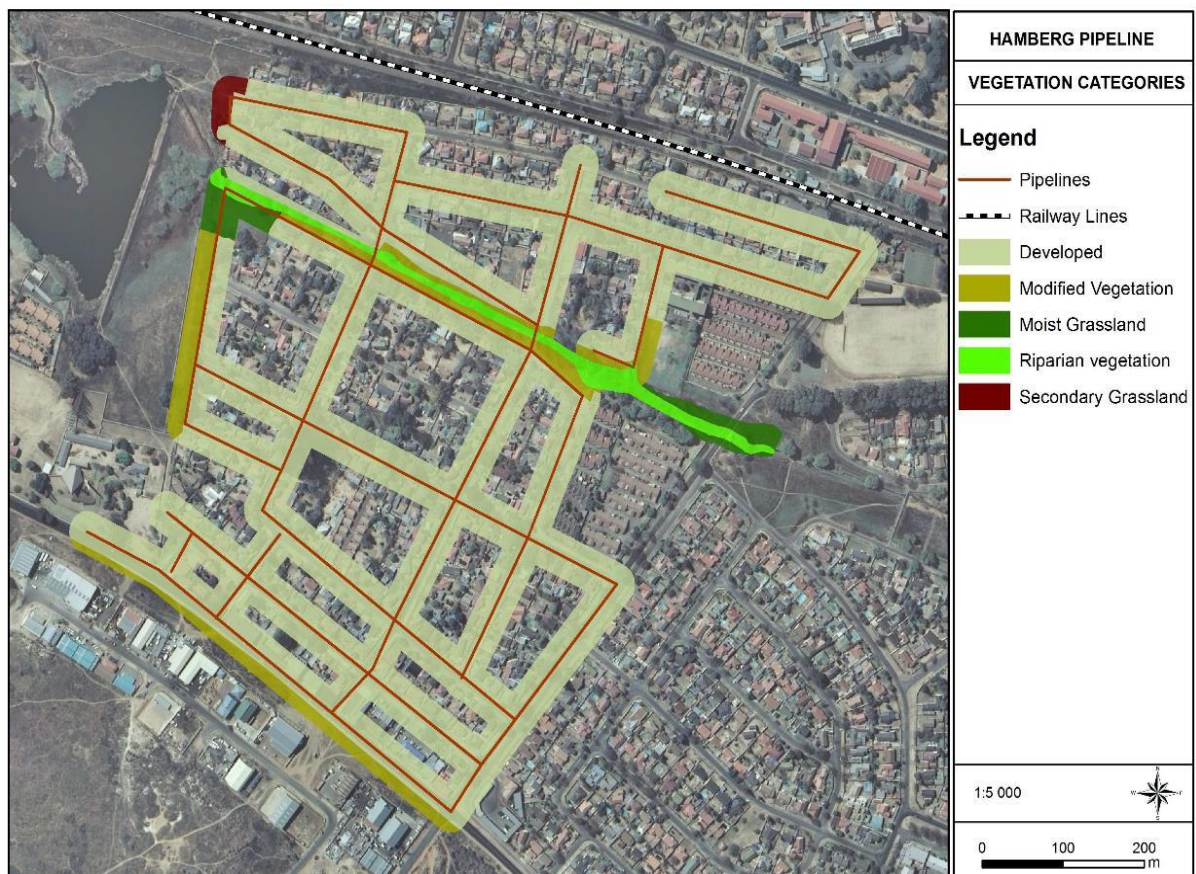


Figure 6: Vegetation Categories

Vegetation associated with watercourses

The pipeline route aligns parallel to a watercourse that flows from west to east through the project area. Within the project area, the watercourse is channelled. West and east of the project area, moist grassland were recorded that could be impacted on by the proposed new pipeline. These areas fall within the Gauteng Conservation Plans ESA and CBA.

- Riparian vegetation

The western section of the watercourse flows through a cemented channel. Vegetation north of the channel comprise mostly of alien and invasive plant species, with *Celtis africana* (witstinkhout) being the only indigenous tree species recorded here. Other trees included the invasive *Morus alba* (mulberry), *Ligustrum* species (privet) and *Tipuana tipu* (tipu tree). The grass (mainly *Pennisetum clandestinum* (kikuyu) and *Cynodon dactylon* (couch grass)) south of the channel is mowed and exotic ornamental trees and shrubs planted.

Eastward, between Eloff and Wandel Street, the watercourse is about 2 to 3m in width and the vegetation was dominated by the invasive *Rubus cuneifolius* (American bramble), along with other invasive species such as *Solanum mauritanum* (bugweed), *Datura ferox* (thorn apple), *Canna indica* and the tree *Populus x canescens* (poplar). The grass layer was dominated by hardy pioneer grasses such as *Cynodon dactylon* (couch grass) and *Eragrostis* species. Tall trees include the invasive *Eucalyptus camaldulensis* (blue gum) and *Salix babylonica* (willow).

The eastern extent, east of Wandel Street, included tall growing alien and invasive trees, as well as the indigenous *Celtis africana* (white stinkwood). Invasive herbaceous species dominated the area surrounding the watercourse and included the grasses *Pennisetum clandestinum* (kikuyu) and *Lolium multiflorum* (ryegrass), and the herbs *Mirabilis jalapa*, *Amaranthus hybridus* and *Chenopodium album* (white goosefoot). The indigenous grass, *Phragmites australis* dominated within the permanently wet areas of the watercourse, while the similar invasive *Arundo donax* was also noted north of the watercourse.

The riparian vegetation along the watercourse was disturbed, dominated by alien and invasive plant species and were considered to be of poor to fair ecological condition. No plant species of conservation concern were recorded in sampled areas. Although the species composition has been modified (altered from the reference state of natural riparian vegetation) and was dominated by alien invasive plant species, the function of the vegetation in the landscape is maintained.

- Moist grassland

Moist grassland (grassland where higher soil moisture and thus wetland conditions are likely) were recorded within and adjacent to the project area. Moist grassland is present at the western extent of Oxley Street, and r

downstream, east of the project area. Downstream impacts can be expected and therefore the moist grassland east of the project area was also assessed.

Moist grassland west of Oxley Street was densely vegetated and included grasses such as *Paspalum dilatatum*, and *Hyparrhenia tamba* (blue thatching grass), as well as the exotic *Bambusa balcooa* (common bamboo) and *Pennisetum clandestinum* (kikuyu). The indigenous tree *Celtis africana* was noted, however, most tree and shrub species were alien and some invasive e.g. *Tecoma stans* (yellow bells) and *Salix babylonica*. It is likely that water draining from Hamberg Dam contributes to the moist grassland conditions. The area was overgrown and no plant species of conservation concern noted, however, the possibility of occurrence cannot be ruled out.

East of the project area, on either side of Potgieter Avenue, the riparian vegetation was edged by moist grassland. The moist grassland has been modified due to continuous mowing and urban edge effects and comprised mainly of grass species such as *Paspalum dilatatum* and *Pennisetum clandestinum* (kikuyu), forbs such as *Plantago lanceolata* and *Senecio inaequidens* and invasive trees such as *Robinia pseudoacacia* and *Tipuana tipu*. Although moist grasslands are suitable habitat to numerous plant species of conservation concern, none were observed.

Both moist grassland areas were considered modified in terms of species composition. However, the vegetation plays an important role in flood attenuation and prevent soil erosion and sedimentation of the adjacent watercourse.

- Secondary grassland

Secondary grasslands develop where the original, undisturbed grassland vegetation was removed or disturbed. When such disturbances cease, pioneer plant species colonise the disturbed areas leading to a pioneer grassland state with a much lower initial species diversity as opposed to the primary (climax) state prior to any disturbances. In the absence of further disturbances, the grassland could reach a secondary grassland state (more diverse and ecologically stable than pioneer grassland, yet lower in species diversity than primary grassland) and theoretically the primary state over time.

In the north-western corner of the project area, secondary grassland was noted within the Bennie Reinecke Park. A small portion of the secondary grassland between Berg Street and Eufees Avenue may be impacted on by the pipeline. The grassland, particularly along the wall bordering the Hamberg residential area that could be impacted on, has been historically disturbed by amongst others the construction of the wall. Aerial imagery also show that mowing or grading of the soils took place. The vegetation along the wall included numerous weedy pioneer species such as *Conyza alba* and *Chenopodium album*. Grasses included *Cynodon dactylon*, *Eragrostis curvula*, *Hyparrhenia hirta* and *Themeda triandra* (red grass) and indigenous forbs *Hermannia drepressa*, *Felicia muricata*, *Helichrysum rugulosum*, *Pentarrhinum insipidum* (donkieperke) and *Senecio consonguineus*

(starvation senecio). Trees were limited to planted Pinaceae species.

The secondary grassland can be classified as moderately modified and in a semi-natural state. However, the section adjacent to the wall that will be impacted on is dominated by weedy pioneer species and unlikely to support plant species of conservation concern. However, impacts in this section could cause edge effects into the secondary grassland that should be avoided or limited as best possible. Therefore, no construction camps should be erected in this area.

- Modified grassland and lawns

Modified landscapes are regarded as areas where the vegetation structure and composition have been compromised and are not representative of the reference state, in this case, of Soweto Highveld Grassland. Modified land can range from moderately modified to severely or irreversibly modified. Subsequently, these areas are usually of a poor ecological condition.

Mowed grassland edge the riparian vegetation along the watercourse. The grassland is regularly mowed and the indigenous species diversity is low consisting of species such as *Eragrostis lehmaniana*, *Cynodon dactylon* (couch grass) and *Paspalum dilatatum*. Forbs were weedy pioneers such as *Plantago lanceolata*, *Sonchus wilmsii* (thistle) and *Taraxacum officinale* (common dandelion). Invasive trees were present.

East of Steyn Street and directly north of the watercourse, a patch of open grassland was recorded. The grass is mowed and historical aerial imagery show the land has been cleared of vegetation at some stage, and likely reseeded with grass. The species diversity was very low, dominated by only a few grass species. Due to recent mowing and the area being fenced, the species could not be positively identified. Grass species that could be recognised included *Paspalum dilataum*, an *Eragrostis* species, *Setaria* species and what is believed to be a *Lolium* species (exotic). Forbs included the weedy *Sonchus* species and *Taraxum officinale* (common dandelion).

Along the south-western boundary of the project area, between Barrie Street and the Bennie Reinecke Park boundary wall, a strip of grass, also regularly mowed, was recorded. The area includes planted exotic trees such as *Quercus* (oak) and *Populus deltoides* (polar), while the invasive succulent species *Cylindropuntia imbricate* (imbricate prickly pear) and *Opuntia ficus-indica* (prickly pear) grew against the wall. As with the other modified grassland patches, the indigenous species diversity was limited.

The most southern pipeline route is situated along Hamberg Road (R24). The route will run north of the road, and is unlikely to impact vegetation opposite the busy R24 road. The grassland on the southern verge of the R24 has been impacted on by construction of industrial areas and are regularly mowed. Stormwater drains water into this grassland which could create artificial wetland conditions. The vegetation is dominated by the grasses *Hyparrhenia hirta* and *Eragrostis* species with limited indigenous forb species. No plant species of conservation

concern are expected to occur here.

The modified grasslands are not representative of Soweto Highveld grassland and do not contribute to the conservation of good condition grassland in Gauteng. These areas may be valuable as open space, water recharge zones and for soil stabilization, but the vegetation is in a poor ecological condition and no plant species of conservation concern were recorded or are expected to occur here.

Terrestrial Fauna

The site is west and just outside the development area. The area represents a large green space associated with the Hamberg Dam. The area provides the most significant fauna habitat in the area and provides terrestrial grassland, wetland, open water within the dam and arboreal, albeit largely AIS and exotic trees. It is most likely that fauna will find refuge within this area due to the limited anthropogenic activity in the area. The area is fenced off and could not be surveyed, but due to the inaccessibility to the site it is highly unlikely to be impacted inadvertently.

Flow from the Hamberg Dam is canalised as it enters the site. The ESA at this point is restricted to the channel and an approximate 5m wide lawn area with a few trees (AIS and exotic) and is relatively restricted and very exposed, with no dense shrub or scrub for fauna to take refuge in. This reduces the value of the ESA as an ecological corridor to some extent. The soils, although largely loam, were loose and could provide habitat for burrowing species, such as mole-rats, although no such evidence was observed in the area.

The canal drains into the tributary which is narrow at the beginning and eventually expands to a greater corridor. Fauna is likely to only sporadically occur in this section of the ESA due to its narrow nature. This would be largely for fauna moving between the Hamberg Dam area and downstream areas of the tributary. Although the AIS would have provided good cover for smaller fauna, this area was being cleared of alien invasive species (see foreground), which commenced the Friday before. Thus any smaller fauna would have retreated away from the area.

The tributary eventually widens as it flows east, creating dense reed-beds within the tributary. Good arboreal habitat is associated with the tributary, but is largely AIS and exotic trees. At this point the tributary offers good cover for fauna and is more likely to be utilised by fauna for cover and refuge than the up-stream locations. It must be stressed that, due the general urban nature of the area and the on-going human activity in the area, animals are more likely to stay within the Hamberg Dam area.

Due to the existing status of the site, no fatal flaws or special recommendations are relevant and no additional faunal assessments or studies are required. From a terrestrial fauna perspective, there is no reason for not authorising the activity as long as the management and monitoring plan is implemented to ensure overall impact

significance stays low.

Gauteng Conservation Plan

The Gauteng Conservation Plan (Version 3.3) classified areas within the province on the basis of its contribution to reach the conservation targets within the province. Critical Biodiversity Areas (CBAs) contain irreplaceable, important and protected areas (terms used in C-Plan 2) and are areas needed to reach the conservation targets of the Province. In addition, ‘Ecological Support Areas’ (ESAs), mainly around riparian areas and other movement corridors were also classified to ensure sustainability in the long term. Landscape features associated with ESAs is essential for the maintenance and generation of biodiversity in sensitive areas and requires sensitive management where incorporated into C-Plan 3.

The area associated with the wetland is classified as Important and Ecological Support Areas. Refer to Figure 7 below. The CBA might be suitable habitat for plant species of conservation concern.

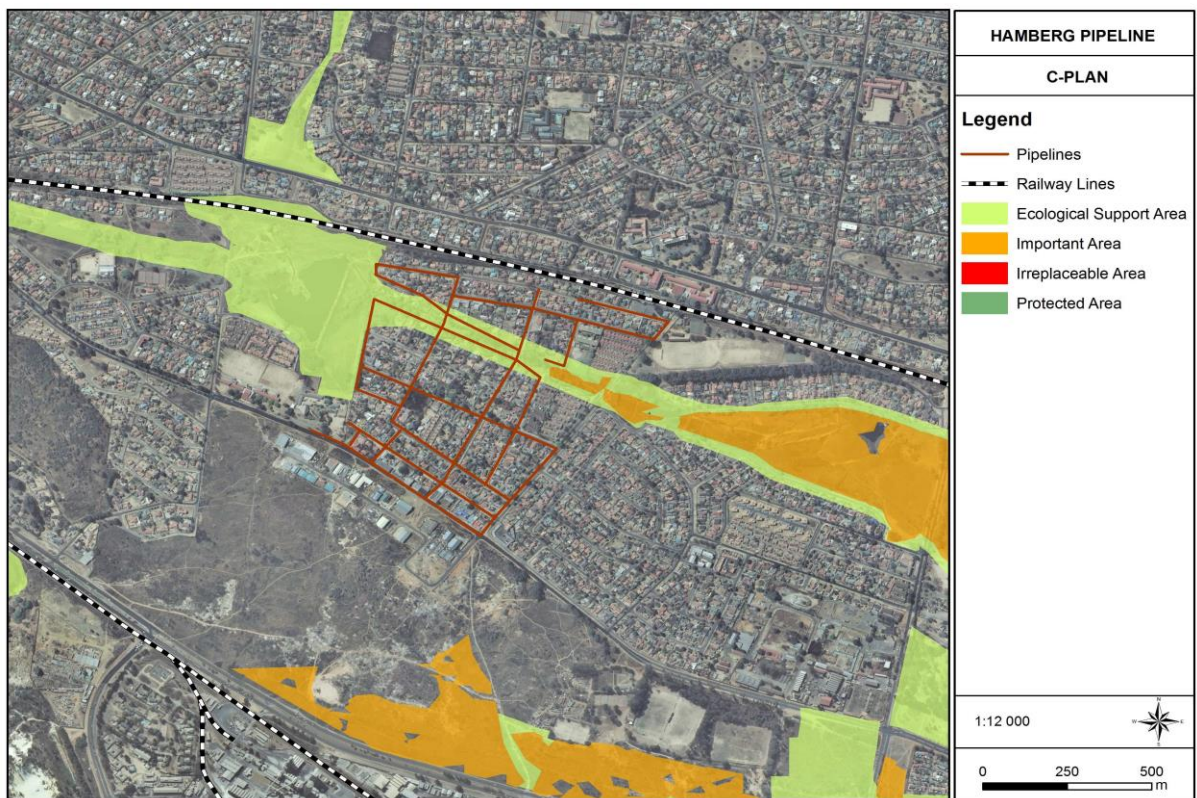


Figure 7: Gauteng Conservation Areas associated with the study site

Refer to **Appendix G1 – Wetland Assessment, Appendix G2 – Fauna Assessment and Appendix G3 – Vegetation Assessment** for full reports.

Was a specialist consulted to assist with completing this section
 If yes complete specialist details

YES

1) Wetland Specialist

Name of the specialist:

Qualification(s) of the specialist:	B. Sc (Botany & Zoology) University of South Africa (1997 - 2001), B. Sc (Hons) Botany University of Pretoria (2003-2005), MSc Ecology, University of South Africa (2010 - ongoing), Short course in wetland delineation, legislation and rehabilitation, University of Pretoria (2007) and Short course in wetland soils, Terrasoil Science (2009).		
Postal address:	P.O. Box 32733, Waverley, Pretoria		
Postal code:	0135		
Telephone:	012 543 9982	Cell:	083 4545 454
E-mail:	antoinette@limosella.co.za	Fax:	
Are any further specialist studies recommended by the specialist?			NO
If YES, specify:	[REDACTED]		
If YES, is such a report(s) attached?	[REDACTED]		
If YES list the specialist reports attached below	[REDACTED]		

Signature of specialist:  Date:

February 2019

Please note: If more than one specialist was consulted to assist with the filling in of this section then this table must be appropriately duplicated

2) Heritage Specialist

Name of the specialist:	J van Schalkwyk		
Qualification(s) of the specialist:	J A van Schalkwyk, D Litt et Phil, heritage consultant, has been working in the field of heritage management for more than 30 years. Based at the National Museum of Cultural History, Pretoria, he has actively done research in the fields of anthropology, archaeology, museology, tourism and impact assessment. This work was done in Limpopo Province, Gauteng, Mpumalanga, North West Province, Eastern Cape, Northern Cape, Botswana, Zimbabwe, Malawi, Lesotho and Swaziland. Based on this work, he has curated various exhibitions at different museums and has published more than 60 papers, many in scientifically accredited journals.		
Postal address:	62 Coetzer Avenue, Monument Park, 0181		
Postal code:	2194		
Telephone:	[REDACTED]	Cell:	076 790 6777
E-mail:	jvschalkwyk@mweb.co.za	Fax:	[REDACTED]
Are any further specialist studies recommended by the specialist?			NO
If YES, specify:	[REDACTED]		
If YES, is such a report(s) attached?	[REDACTED]		
If YES list the specialist reports attached below	[REDACTED]		

Signature of specialist:  Date:

February 2019

3) Flora Specialist

Name of the specialist:	Antoinette Eyssell-Knox		
Qualification(s) of the specialist:	<ul style="list-style-type: none"> • M.Sc Environmental Science, University of Pretoria (2010) Dissertation: <i>Land cover change and its effect on future land uses</i> • B. Sc (Hons) Horticulture, University of Pretoria (1999-2000) Dissertation: <i>Horticultural uses of the indigenous Barleria species</i> • B. Sc (Agriculture) Horticulture, University of Pretoria (1993-1996) 		
Postal address:	[REDACTED]		
Postal code:	[REDACTED]		
Telephone:	[REDACTED]	Cell:	082 642 6295
E-mail:	Antoinette@dimela-eco.co.za	Fax:	[REDACTED]
Are any further specialist studies recommended by the specialist?	[REDACTED]		NO
If YES, specify:	[REDACTED]		
If YES, is such a report(s) attached?	[REDACTED]		
If YES list the specialist reports attached below	[REDACTED]		

Signature of specialist:		Date:	February 2019
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4) Fauna Specialist

Name of the specialist:	Barbara Kasl		
Qualification(s) of the specialist:	<ul style="list-style-type: none"> • PhD in Animal, Plant and Environmental Sciences, University of the Witwatersrand (2004) • SACNASP Professional Ecological and Environmental Scientist (Pr.Sci.Nat. Registration No.: 400257/09) • Entomological Society of South Africa. 		
Postal address:	[REDACTED]		
Postal code:	[REDACTED]		
Telephone:	[REDACTED]	Cell:	+27 71 988 6773
E-mail:	bk.zoology@gmail.com	Fax:	[REDACTED]
Are any further specialist studies recommended by the specialist?	[REDACTED]		NO
If YES, specify:	[REDACTED]		
If YES, is such a report(s) attached?	[REDACTED]		
If YES list the specialist reports attached below	[REDACTED]		

Signature of specialist:		Date:	February 2019
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8. LAND USE CHARACTER OF SURROUNDING AREA

Using the associated number of the relevant current land use or prominent feature from the table below, fill in the position of these land-uses in the vacant blocks below which represent a 500m radius around the site

1. Vacant land	2. River, stream, wetland	3. Nature conservation area	4. Public open space	5. Koppie or ridge
6. Dam or reservoir	7. Agriculture	8. Low density residential	9. Medium to high density residential	10. Informal residential
11. Old age home	12. Retail	13. Offices	14. Commercial & warehousing	15. Light industrial
16. Heavy industrial ^{AN}	17. Hospitality facility	18. Church	19. Education facilities	20. Sport facilities
21. Golf course/polo fields	22. Airport ^N	23. Train station or shunting yard ^N	24. Railway line ^N	25. Major road (4 lanes or more) ^N
26. Sewage treatment plant ^A	27. Landfill or waste treatment site ^A	28. Historical building	29. Graveyard	30. Archeological site
31. Open cast mine	32. Underground mine	33. Spoil heap or slimes dam ^A	34. Small Holdings	
Other land uses (describe):				

NOTE: Each block represents an area of 250m X 250m, if your proposed development is larger than this please use the appropriate number and orientation of hashed blocks

NORTH

	2, 17	2, 9	9	9	9, 19	
	9	2, 9	2, 9	9	9	
WEST	9	9		2, 9	1, 20	EAST
	14, 18	9	9	9	1, 2	
	14	14	9	9	9	

SOUTH

Note: More than one (1) Land-use may be indicated in a block

Please note: The Department may request specialist input/studies depending on the nature of the land use character of the area and potential impact(s) of the proposed activity/ies. Specialist reports that look at health & air quality and noise impacts may be required for any feature above and in particular those features marked with an “A” and with an “N” respectively.

Have specialist reports been attached
If yes indicate the type of reports below

YES	
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Appendix G1 – Wetland/Riparian Delineation and Functional Assessment
Appendix G1(i) – General Wetland Rehabilitation and Monitoring Plan

Appendix G2 – Terrestrial Fauna Impact Assessment and Management Plan
Appendix G3 – Vegetation Assessment
Appendix G4 – Heritage Impact Assessment

Land Use/ Cover

The majority of the study area contributes to an urban built up environment with small open areas. These open areas either form part of parks, golf courses or are fenced off to the public. Some of the wetlands are incorporated into green spaces which serves as parks, dog walkways etc. The wetlands in this area are an important feature as they form ecological corridors for animals to travel in. They also provide specialised habitat and breeding areas.

9. SOCIO-ECONOMIC CONTEXT

Describe the existing social and economic characteristics of the area and the community condition as baseline information to assess the potential social, economic and community impacts.

The City of Johannesburg Local Municipality is situated in Gauteng province and covers an area of 1645km². The City of Johannesburg Local Municipality is divided into seven regions, designated alphabetically from A to G. The proposed development is located within **Region C**.

Population

The City of Johannesburg has a population of approximately 4.4 million people made up primarily of a young population aged between 30 and 39 years. The total population translates into roughly 1.4 million households with an average household size of 3 persons. At a regional level, Region D is the most densely populated region in the City with 24.4% followed by Regions G (16.7%), F (13.4%), A (12.6%), E (11.8%), **C (11.6%)** and B (9.4%) respectively.

In terms of gender, 50.2% of the population is male and 49.8% is female. Majority of the population are black (76.4%), followed by 12.3% white, 5.6% coloured, 4.9% indian, and 0.8% other. The predominant languages within the City are Zulu (23.1%), followed by English (19.8%) and Sotho (9.5%).

Hamberg falls within the Roodepoort area. Roodepoort covers an area of 161.50 km² with a total population of approximately 326 416 inhabitants within 109 707 households. In terms of gender, 50.33% of the population is female and 49.67% is male. Majority of the population are black (51.42%), followed 35.40% white, 8.23% coloured, 4.01% indian and 0.94% other. The predominant languages are English (29.81%) and Afrikaans (23.97%).

Hamberg covers an area of 0.48 km² with a total population of approximately 1963 inhabitants within 570

households. In terms of gender, 50.99% of the population is female and 49.01% is male. Majority of the population are coloured (40.75%), followed by 26.13% white, 24.61% black, 8.20% indian and 0.31% other. The predominant language is English (56.24%), followed by Afrikaans (22.41%).

Economic Profile

The City of Johannesburg's economy is driven primarily by four economic sectors which are: (a) finance and business services, (b) community services, (c) manufacturing, and (d) trade. These four economic sectors collectively account for more than 82% of economic activity within the City. These sectors also account for the highest levels of formal and informal employment. This state of affairs suggests that the City of Johannesburg's economy is highly concentrated; making it vulnerable to sudden external shocks such as the recession experienced during 2008/09. Every opportunity should therefore be explored to diversify the economy into other sectors in which the City enjoys a comparative advantage.

Roodepoort has seen large population growth due to urban sprawl. Areas of interest for entertainment include the Featherbrooke Village shopping centre which is one of the student hotspots. Roodepoort has a wide variety of restaurants and shopping centres such as Clearwater Mall, Westgate Shopping Centre and 14th Avenue District Shopping Centre, all within 10km from the Hamberg area.

Employment

The City has a high unemployment level of 25%. Of the 1 228 666 economically active youth (15–35 years), 31.5% are unemployed. Regional analysis shows that Region D had the highest level of unemployment (42.7%) followed by Regions G (28.1%), F (26.2%) and A (15.7%). Regions E, B and C have the lowest rates of unemployment at 2.3%, 9.2% and 11.7% respectively. Youth unemployment remains a major challenge both nationally and for the City. Low education levels and slow formal sector growth are two of the major causes of youth unemployment. The vast majority of the youthful population in Johannesburg has only a matric certificate preventing access to the labour market (CoJ IDP 2012/2016).

Education

In terms of education within the City of Johannesburg Local Municipality, of those 20 years and older 3.4% have completed primary school, 32.4% have some secondary education, 34.9% have completed matric, 19.2% have some form of higher education, and 2.9% of those aged 20 years and older have no form of schooling.

1.8% of the population aged 20+ Roodepoort have received no education, 29.7% has received some form of higher education, and 36.1% has completed matric. Roodepoort is home to several schools including Florida Primary School, Ruimsig Academy, Constantia Kloof Primary School, Discovery Primary School Full Service School and St Catherine's Convent School amongst many others. Roodepoort is also home to the science

campus of the University of South Africa (UNISA).

Schools in Hamberg include Victory House Private School, Roodepark School, Wellinkwise Nursery School and several others.

10. CULTURAL/HISTORICAL FEATURES

Please be advised that if section 38 of the National Heritage Resources Act 25 of 1999 is applicable to your proposal or alternatives, then you are requested to furnish this Department with written comment from the South African Heritage Resource Agency (SAHRA) – Attach comment in appropriate annexure

38. (1) Subject to the provisions of subsections (7), (8) and (9), any person who intends to undertake a development categorised as-

- (a) the construction of a road, wall, power line, pipeline, canal or other similar form of linear development or barrier exceeding 300m in length;
- (b) the construction of a bridge or similar structure exceeding 50m in length;
- (c) any development or other activity which will change the character of a site-
 - (i) exceeding 5 000 m² in extent; or
 - (ii) involving three or more existing erven or subdivisions thereof; or
 - (iii) involving three or more erven or divisions thereof which have been consolidated within the past five years; or
 - (iv) the costs of which will exceed a sum set in terms of regulations by SAHRA or a provincial heritage resources authority;
- (d) the re-zoning of a site exceeding 10 000 m² in extent; or
- (e) any other category of development provided for in regulations by SAHRA or a provincial heritage resources authority, must at the very earliest stages of initiating such a development, notify the responsible heritage resources authority and furnish it with details regarding the location, nature and extent of the proposed development.

Are there any signs of culturally (aesthetic, social, spiritual, environmental) or historically significant elements, as defined in section 2 of the National Heritage Resources Act, 1999, (Act No. 25 of 1999), including archaeological or palaeontological sites, on or close (within 20m) to the site?

If YES, explain:

	NO
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If uncertain, the Department may request that specialist input be provided to establish whether there is such a feature(s) present on or close to the site.

Briefly explain the findings of the specialist if one was already appointed:

The cultural landscape qualities of the region are made up of a pre-colonial element consisting of very limited Stone Age and Iron Age occupation, as well as a much later colonial (farmer) component, which eventually gave rise to an urban and industrial (mining) component. No sites, features or objects of cultural significance were identified. Although some sections of Hamberg suburb is older than sixty years, the pipeline replacement would take place in the road reserve, which limits the possibility of it impacting on the built environment. In the rest of the suburb, all features that might have existed prior to the development of the suburb taking place would have

been destroyed by the building processes. Consequently, there would be no impact as a result of the proposed development. Thus, from a heritage point of view, it is recommended that the proposed development be allowed to continue. Should archaeological sites or graves be exposed in other areas during construction work, it must immediately be reported to a heritage practitioner so that an investigation and evaluation of the finds can be made.

Refer to **Appendix G4 – Heritage Impact Assessment** for full report.

Will any building or structure older than 60 years be affected in any way?
 Is it necessary to apply for a permit in terms of the National Heritage Resources Act, 1999 (Act 25 of 1999)?
 If yes, please attached the comments from SAHRA in the appropriate Appendix

YES	
	NO

SECTION C: PUBLIC PARTICIPATION (SECTION 41)

1. The Environmental Assessment Practitioner must conduct public participation process in accordance with the requirement of the EIA Regulations, 2014.

2. LOCAL AUTHORITY PARTICIPATION

Local authorities are key interested and affected parties in each application and no decision on any application will be made before the relevant local authority is provided with the opportunity to give input. The planning and the environmental sections of the local authority must be informed of the application at least thirty (30) calendar days before the submission of the application to the competent authority.

Was the draft report submitted to the local authority for comment?

YES

If yes, has any comments been received from the local authority?

NO

If "YES", briefly describe the comment below (also attach any correspondence to and from the local authority to this application):

If "NO" briefly explain why no comments have been received or why the report was not submitted if that is the case.

The report is at a draft stage and is being submitted to the local authority for the 30 days legislated commenting period. Comments are anticipated during the 30-day review period.

3. CONSULTATION WITH OTHER STAKEHOLDERS

Any stakeholder that has a direct interest in the activity, site or property, such as servitude holders and service providers, should be informed of the application at least **thirty (30) calendar days** before the submission of the application and be provided with the opportunity to comment.

Has any comment been received from stakeholders?

YES

If "YES", briefly describe the feedback below (also attach copies of any correspondence to and from the stakeholders to this application):

Summary of comments raised by Interested and/ Affected Parties/ Stakeholders on the Application are as follows:

CIlr suggested a public meeting be held and a referred a member of the Hamberg Residents Association be registered as an IAP on the project database.

For details please refer to the **Comments and Response Report** attached as **Appendix E6** and **Correspondence** attached as **Appendix E4**.

If "NO" briefly explain why no comments have been received

4. GENERAL PUBLIC PARTICIPATION REQUIREMENTS

The Environmental Assessment Practitioner must ensure that the public participation process is adequate and must determine whether a public meeting or any other additional measure is appropriate or not based on the particular nature of each case. Special attention should be given to the involvement of local community structures such as Ward Committees and ratepayers associations. Please note that public concerns that emerge at a later stage that should have been addressed may cause the competent authority to withdraw any authorisation it may have issued if it becomes apparent that the public participation process was flawed.

The EAP must record all comments and respond to each comment of the public / interested and affected party before the application report is submitted. The comments and responses must be captured in a Comments and Responses Report as prescribed in the regulations and be attached to this application.

Throughout the BA process, public participation receives high priority. Public participation is one of the most important elements of the development process; therefore, Interested and Affected Parties (I&APs) were identified as part of the Public Participation Process, including occupiers of the property, owners and occupiers of land adjacent to the site, municipal officials and relevant State Departments. All respondents were then registered on the project database. This database was supplemented by I&APs that contacted our Public Participation consultant to be included on the database. The database was used throughout the process to inform all I&APs of the project and is attached within **Appendix E9**.

In order to canvass the issues and concerns of the broader public and to ensure that all I&APs are afforded the opportunity to comment on the proposed development, the proposed project was announced as follows:

- Site notices (size A2) advertising the proposed development and displaying the contact details of the EAP were prepared and displayed on site. The site notices served the purpose of informing potential I&APs of the project and therefore afforded them the opportunity to comment. Refer to **Appendix E1** for Proof of Site Notices.
- Distribution of the notification letter with a Registration and Comment Sheet, and the locality map to state departments and other potential stakeholders through emails. Refer to **Appendix E2** for the notification letter.
- Hand-delivered the notification letter with Registration and Comment Sheet to the adjacent landowners in close proximity of the boundary of the property. Refer to **Appendix E2** for knock and drop register.
- Published an advertisement in the newspaper. Refer to **Appendix E3** for proof of advertisement.
- Communication with local authorities and stakeholders. Refer to **Appendix E4** for proof of correspondence with I&APs.

Please note that any further comments received during the review period of the Draft Basic Assessment as well as responses provided will be captured and recorded within the Comments and Response Report, attached as **Appendix E6** in the Final Basic Assessment Report.

A copy of the Draft Basic Assessment Report for public review has been made available for public review at the nearest public library for a legislated 30-day commenting period.

5. APPENDICES FOR PUBLIC PARTICIPATION

All public participation information is to be attached in the appropriate Appendix. The information in this Appendix is to be ordered as detailed below

Appendix 1 – Proof of site notice Attached as **Appendix E1**

Appendix 2 – Written notices issued as required in terms of the regulations Attached as **Appendix E2**

Appendix 3 – Proof of newspaper advertisements Attached as **Appendix E3**

Appendix 4 – Communications to and from interested and affected parties Attached as **Appendix E4**

Appendix 5 – Minutes of any public and/or stakeholder meetings – **N/A at this stage**

Appendix 6 – Comments and Responses Report Attached as **Appendix E6**

Appendix 7 – Comments from I&APs on Basic Assessment (BA) Report – **N/A at this stage, comments are anticipated during the Draft BAR review period**

Appendix 8 – Comments from I&APs on amendments to the BA Report – **N/A**

Appendix 9 – Copy of the register of I&APs Attached as **Appendix E9**

SECTION D: RESOURCE USE AND PROCESS DETAILS

Note: Section D is to be completed for the proposal and alternative(s) (if necessary)

Instructions for completion of Section D for alternatives

- 1) For each alternative under investigation, where such alternatives will have different resource and process details (e.g. technology alternative), the entire Section D needs to be completed
- 4) Each alternative needs to be clearly indicated in the box below
- 5) Attach the above documents in a chronological order

Section D has been duplicated for alternatives [redacted] times (complete only when appropriate)

Section D Alternative No. [redacted] (complete only when appropriate for above)

1. WASTE, EFFLUENT, AND EMISSION MANAGEMENT

Solid waste management

Will the activity produce solid construction waste during the construction/initiation phase?
If yes, what estimated quantity will be produced per month?

YES	[redacted]
Could not be determined at this stage	

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

Construction rubble/ solid waste will be temporarily stored on site in designated waste skips and then removed by an appropriate waste contractor appointed by the main construction contractor to an approved landfill site. This will be managed through the EMPr – **Appendix H**.

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

General waste removed from site will be disposed of at a suitably licensed disposal facility. The nearest licensed landfill site shall be utilised. Safe disposal certificates must be obtained and kept on site for the duration of the construction phase.

Will the activity produce solid waste during its operational phase?
If yes, what estimated quantity will be produced per month?

[redacted]	NO
------------	----

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

[redacted]

Has the municipality or relevant service provider confirmed that sufficient air space exists for treating/disposing of the solid waste to be generated by this activity?

[redacted]	NO
------------	----

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

[redacted]

Note: 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, 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 relevant legislation? NO
 If yes, inform the competent authority and request a change to an application for scoping and EIA.

Is the activity that is being applied for a solid waste handling or treatment facility? 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.

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

During Construction, wastes must be separated at source and disposed at relevant suitably licensed facilities. Waste should be separated into recyclable and non-recyclable materials and distributed for recycling where applicable. During the construction phase, construction waste rubble should be used as fill material and as foundation for the proposed upgrade processes where possible. The re-use of construction waste materials will minimize the amount of waste that will need to be disposed of at registered municipal waste facilities. In addition, there will be extensive earthworks, but import and export of material will be minimised by balancing cut and fill requirements as far as possible.

Liquid effluent (other than domestic sewage)

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?
 If yes, has the municipality confirmed that sufficient capacity exist for treating / disposing of the liquid effluent to be generated by this activity(ies)?

Will the activity produce any effluent that will be treated and/or disposed of on-site? NO
 If yes, what estimated quantity will be produced per month?

If yes describe the nature of the effluent and how it will be disposed.

Note that if effluent is to be treated or disposed on site 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:
 E-mail:

Cell:
 Fax:

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

Liquid effluent (domestic sewage)

Will the activity produce domestic effluent that will be disposed of in a municipal sewage NO

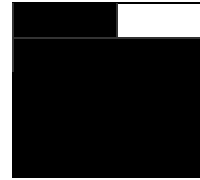
system?

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

If yes, has the municipality confirmed that sufficient capacity exist for treating / disposing of the domestic effluent to be generated by this activity (ies)?

Will the activity produce any effluent that will be treated and/or disposed of on site?

If yes describe how it will be treated and disposed off.



Chemical toilets are going to be used and the sewage waste will be collected by the Waste service provider for treatment at a treatment facility.

Emissions into the atmosphere

Will the activity release emissions into the atmosphere?

YES	
	NO

If yes, is it controlled by any legislation of any sphere of government?

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.

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

The activity itself will not contribute directly to emissions released into the atmosphere except possible short-term dust emissions during the construction phase. Emissions generated will be in the form of dust, carbon dioxide and other vehicle emissions generated by diesel powered machinery and trucks during the construction process i.e. tip trucks, TLB's, excavators and dust from the movement of the construction vehicles. These emissions will be composed primarily of CO₂ and will be of a low concentration.

2. WATER USE

Indicate the source(s) of water that will be used for the activity

Municipal	Directly from water board	groundwater	river, stream, dam or lake	other	the activity process itself will not use water
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

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:

If Yes, please attach proof of assurance of water supply, e.g. yield of borehole, in the appropriate Appendix

Does the activity require a water use permit from the Department of Water Affairs?

YES	
-----	--

If yes, list the permits required

The proposed development also requires a Water Use License from the Department of Water and Sanitation in terms of National Water Act No. 36 of 1998 for the following specific water uses:

- Section 21(c): Impeding or diverting the flow of water in a watercourse; and
- Section 21(i): Altering the bed, banks, course or characteristics of a watercourse.

If yes, have you applied for the water use permit(s)?

YES	
	NO

If yes, have you received approval(s)? (attached in appropriate appendix)

A Water Use License Application is currently being uploaded onto the DWS eWULAAS portal. Refer to **Appendix F** for proof thereof.

3. POWER SUPPLY

Please indicate the source of power supply eg. Municipality / Eskom / Renewable energy source

The development will not require power supply during its operation phase. However generators will be used as a source of power if needed during the construction phase.

If power supply is not available, where will power be sourced from?

As above.

4. ENERGY EFFICIENCY

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

No particular considerations of energy saving/ conservation were deemed applicable in this project. The scope of work will be structured in a way that, where possible, the use of labour intensive methods will be employed. Not only will it serve the local community but it also saves the use of Pneumatic Equipment that requires a lot of energy input.

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

The proposed development is not an energy-intensive development that will require energy/electricity input for its continued operations and will therefore not consume energy during its operation phase.

SECTION E: IMPACT ASSESSMENT

The assessment of impacts must adhere to the minimum requirements in the EIA Regulations, 2014, 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 as well as the impacts of not implementing the activity (Section 24(4) (b) (i)).

1. ISSUES RAISED BY INTERESTED AND AFFECTED PARTIES

Summarise the issues raised by interested and affected parties.

Issue/ Comment/ Concern	Response
	The DBAR review period is currently underway. Once concluded, the issues and comments raised by IAP's will be collated and responded to. These responses will be incorporated into the Final BAR.

Summary of response from the practitioner to the issues raised by the interested and affected parties (including the manner in which the public comments are incorporated or why they were not included).
(A full response must be provided in the Comments and Response Report that must be attached to this report):

The DBAR review period is currently underway. Once concluded, the issues and comments raised by IAP's throughout the process will be collated and responded to accordingly. These responses will be incorporated into the Final BAR for submission to GDARD for review and decision-making.

2. IMPACTS THAT MAY RESULT FROM THE CONSTRUCTION AND OPERATIONAL PHASE

Briefly describe the methodology utilised in the rating of significance of impacts

The following methodology and criteria was used in assessing impacts related to the proposed development.

- The **Nature**, a description of what causes the effect, what will be affected, and how it will be affected.
- The **Extent**, wherein it is indicated whether:
 - 1 is limited to the immediate area or site of development
 - 2 is the local area
 - 3 is regional
 - 4 is national
 - 5 is international
- The **Duration**, wherein it is indicated whether:
 - The lifetime of the impact will be of a very short duration (0–1 years) – assigned a score of 1;
 - The lifetime of the impact will be of a short duration (2-5 years) - assigned a score of 2;
 - Medium-term (5–15 years) – assigned a score of 3;
 - Long term (> 15 years) - assigned a score of 4; or;
 - Permanent - assigned a score of 5.
- The **Magnitude**, quantified on a scale from 0-10, where a score is assigned:

- 0 is small and will have no effect on the environment;
- 2 is minor and will not result in an impact on processes;
- 4 is low and will cause a slight impact on processes;
- 6 is moderate and will result in processes continuing but in a modified way;
- 8 is high (processes are altered to the extent that they temporarily cease); and
- 10 is very high and results in complete destruction of patterns and permanent cessation of processes.

➤ The **Probability** of occurrence, which describes the likelihood of the impact actually occurring. Probability is estimated on a scale, and a score assigned:

- Assigned a score of 1–5, where 1 is very improbable (probably will not happen);
- Assigned a score of 2 is improbable (some possibility, but low likelihood);
- Assigned a score of 3 is probable (distinct possibility);
- Assigned a score of 4 is highly probable (most likely); and
- Assigned a score of 5 is definite (impact will occur regardless of any prevention measures).

➤ The **Significance**, which is determined through a synthesis of the characteristics described above (refer formula below) and can be assessed as low, medium or high.

- The status, which is described as **positive, negative** or **neutral**.
- The degree to which the impact can be reversed.
- The degree to which the impact may cause irreplaceable loss of resources.
- The degree to which the impact can be mitigated.

The significance is determined by combining the criteria in the following formula:

S= (E+D+M) P; where

S = Significance weighting

E = Extent

D = Duration

M = Magnitude

P = Probability

The significance weightings for each potential impact are as follows:

- **< 30 points: Low** (i.e. where this impact would not have a direct influence on the decision to develop in the area),
- **30-60 points: Medium** (i.e. where the impact could influence the decision to develop in the area unless it is effectively mitigated),
- **> 60 points: High** (i.e. where the impact must have an influence on the decision process to develop in the area).

Briefly describe and compare the potential impacts (as appropriate), significance rating of impacts, proposed mitigation and significance rating of impacts after mitigation that are likely to occur as a result of the **construction phase** for the various alternatives of the proposed development. This must include an assessment of the significance of all impacts.

Method Alternative 1: Construction of uPVC pipe using open trenching method (Preferred)

Table 7: Construction Impacts

POTENTIAL IMPACTS	PROPOSED MITIGATION	RISK OF THE IMPACT MITIGATION NOT BEING IMPLEMENTED																					
<p>Nature of Impact: <u>Changing the quantity and fluctuation properties of the watercourse by for example diverting or obstructing flow.</u></p> <p>Source: The compaction of soil and the clearing of vegetation in the delineated wetland and buffer zone.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Description</th> <th style="text-align: center;">Without Mitigation</th> <th style="text-align: center;">With Mitigation</th> </tr> </thead> <tbody> <tr> <td>Probability</td> <td style="text-align: center;">Probable (3)</td> <td style="text-align: center;">Improbable (2)</td> </tr> <tr> <td>Duration</td> <td style="text-align: center;">Long term (4)</td> <td style="text-align: center;">Medium term (3)</td> </tr> <tr> <td>Extent</td> <td style="text-align: center;">Regional (3)</td> <td style="text-align: center;">Local (2)</td> </tr> <tr> <td>Magnitude</td> <td style="text-align: center;">Moderate (6)</td> <td style="text-align: center;">Moderate (6)</td> </tr> <tr> <td>Significance</td> <td style="text-align: center;">39 (Medium)</td> <td style="text-align: center;">22 (Low)</td> </tr> <tr> <td>Status (positive or negative)</td> <td style="text-align: center;">Negative</td> <td style="text-align: center;">Negative</td> </tr> </tbody> </table>	Description	Without Mitigation	With Mitigation	Probability	Probable (3)	Improbable (2)	Duration	Long term (4)	Medium term (3)	Extent	Regional (3)	Local (2)	Magnitude	Moderate (6)	Moderate (6)	Significance	39 (Medium)	22 (Low)	Status (positive or negative)	Negative	Negative	<ul style="list-style-type: none"> • A temporary fence or demarcation must be erected around No-Go Areas outside the proposed works area prior to any construction taking place as part of the contractor planning phase when compiling work method statements to prevent access to the adjacent portions of the watercourse. • Effective stormwater management should be a priority during the construction phase. This should be monitored as part of the EMP. High energy stormwater input into the watercourses should be prevented at all cost. • Sediment control should be effective and not allow any release of sediment pollution downstream. This should be audited on a weekly basis to demonstrate compliance with upstream conditions. 	<p>Impacts to the flow characteristics of this watercourse are likely to be permanent unless mitigated and/ or rehabilitated.</p>
Description	Without Mitigation	With Mitigation																					
Probability	Probable (3)	Improbable (2)																					
Duration	Long term (4)	Medium term (3)																					
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Significance	39 (Medium)	22 (Low)																					
Status (positive or negative)	Negative	Negative																					
<p>Nature of Impact: <u>Changes in sediment entering and exiting the system.</u></p> <p>Source: Changing the amount of sediment entering the water resource and associated change in turbidity (increasing or</p>	<ul style="list-style-type: none"> • Consider the various methods and equipment available and select whichever method(s) will have the least impact on watercourses. • Water may seep into trenching and earthworks. It is likely that water will be contaminated within these earthworks and should 	<p>Expected to be limited provided that the mitigation measures are implemented correctly and effective rehabilitation of the site is undertaken where necessary.</p>																					

POTENTIAL IMPACTS	PROPOSED MITIGATION	RISK OF THE IMPACT MITIGATION NOT BEING IMPLEMENTED																		
<p>decreasing the amount). Construction and operational activities will result in earthworks and soil disturbance as well as the removal of natural vegetation. This could result in the loss of topsoil, sedimentation of the wetland and increase the turbidity of the water.</p> <p>Possible sources of the impacts include:</p> <ul style="list-style-type: none"> • Earthwork activities during construction. • Clearing of surface vegetation will expose the soils, which in rainy events would wash through the watercourse, causing sedimentation. In addition, indigenous vegetation communities are unlikely to colonise eroded soils successfully and seeds from proximate alien invasive trees can spread easily into these eroded soil. • Disturbance of soil surface. • Disturbance of slopes through creation of roads and tracks adjacent to the watercourse. • Erosion (e.g. gully formation, bank collapse). <table border="1" data-bbox="190 1150 813 1391"> <thead> <tr> <th>Description</th> <th>Without Mitigation</th> <th>With Mitigation</th> </tr> </thead> <tbody> <tr> <td>Probability</td> <td>Probable (3)</td> <td>Improbable (2)</td> </tr> <tr> <td>Duration</td> <td>Long term (4)</td> <td>Medium term (3)</td> </tr> <tr> <td>Extent</td> <td>Regional (3)</td> <td>Local (2)</td> </tr> <tr> <td>Magnitude</td> <td>Moderate (6)</td> <td>Moderate (6)</td> </tr> <tr> <td>Significance</td> <td style="background-color: yellow;">39 (Medium)</td> <td style="background-color: green;">22 (Low)</td> </tr> </tbody> </table>	Description	Without Mitigation	With Mitigation	Probability	Probable (3)	Improbable (2)	Duration	Long term (4)	Medium term (3)	Extent	Regional (3)	Local (2)	Magnitude	Moderate (6)	Moderate (6)	Significance	39 (Medium)	22 (Low)	<p>thus be cleaned or dissipated into a structure that allows for additional sediment input and slows down the velocity of the water thus reducing the risk of erosion. Effective sediment traps should be installed.</p> <ul style="list-style-type: none"> • Construction in and around watercourses must be restricted to the dryer winter months where possible. • Remove only the vegetation where essential for construction and do not allow any disturbance to the adjoining natural vegetation cover. • Protect all areas susceptible to erosion and ensure that there is no undue soil erosion resultant from activities within and adjacent to the construction camp and work areas. • Runoff from the construction area must be managed to avoid erosion and pollution problems. • Implementation of best management practices • Maintain buffer zones to trap sediments • Monitoring should be done to ensure that sediment pollution is timeously dressed. 	
Description	Without Mitigation	With Mitigation																		
Probability	Probable (3)	Improbable (2)																		
Duration	Long term (4)	Medium term (3)																		
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POTENTIAL IMPACTS			PROPOSED MITIGATION	RISK OF THE IMPACT MITIGATION NOT BEING IMPLEMENTED																					
<i>Status (positive or negative)</i>	Negative	Negative																							
<p>Nature of impact: <u>Introduction and spread of alien vegetation.</u></p> <p>Source: The moving of soil and vegetation resulting in opportunistic invasions after disturbance and the introduction of seed in building materials and on vehicles. Invasions of alien plants can impact on hydrology, by reducing the quantity of water entering a watercourse, and outcompete natural vegetation, decreasing the natural biodiversity. Once in a system alien invasive plants can spread through the catchment. If allowed to seed before control measures are implemented alien plants can easily colonise and impact on downstream users.</p> <table border="1"> <thead> <tr> <th>Description</th> <th>Without Mitigation</th> <th>With Mitigation</th> </tr> </thead> <tbody> <tr> <td>Probability</td> <td>Highly Probable (4)</td> <td>Probable (3)</td> </tr> <tr> <td>Duration</td> <td>Long term (4)</td> <td>Medium term (3)</td> </tr> <tr> <td>Extent</td> <td>Local (2)</td> <td>Local (2)</td> </tr> <tr> <td>Magnitude</td> <td>Low (4)</td> <td>Low (4)</td> </tr> <tr> <td>Significance</td> <td>40 (Medium)</td> <td>27 (Low)</td> </tr> <tr> <td>Status (positive or negative)</td> <td>Negative</td> <td>Negative</td> </tr> </tbody> </table>			Description	Without Mitigation	With Mitigation	Probability	Highly Probable (4)	Probable (3)	Duration	Long term (4)	Medium term (3)	Extent	Local (2)	Local (2)	Magnitude	Low (4)	Low (4)	Significance	40 (Medium)	27 (Low)	Status (positive or negative)	Negative	Negative	<ul style="list-style-type: none"> • Implement an Alien Plant Control Plan • Retain vegetation and soil in position for as long as possible, removing it immediately ahead of construction / earthworks in that area and returning it where possible afterwards. • Monitor the establishment of alien invasive species within the areas affected by the construction and maintenance and take immediate corrective action where invasive species are observed to establish. 	Expected to be limited provided that the mitigation measures are implemented correctly and effective rehabilitation of the site is undertaken where necessary.
Description	Without Mitigation	With Mitigation																							
Probability	Highly Probable (4)	Probable (3)																							
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Magnitude	Low (4)	Low (4)																							
Significance	40 (Medium)	27 (Low)																							
Status (positive or negative)	Negative	Negative																							
<p>Nature of the Impact: <u>Loss and disturbance of watercourse habitat and fringe vegetation.</u></p> <p>Source: Trenching parallel and into the watercourse may affect remaining natural wetland habitat by removal of vegetation and disturbance of soil.</p>			<ul style="list-style-type: none"> • Where construction occurs in the demarcated watercourse and buffer, extra precautions should be implemented so as to minimise habitat loss. • Other than approved and authorized structure, no other development or maintenance infrastructure is allowed within the delineated watercourse or associated buffer zones. 	Expected to be limited provided that the mitigation measures are implemented correctly and effective rehabilitation of the site is undertaken where necessary.																					

POTENTIAL IMPACTS			PROPOSED MITIGATION	RISK OF THE IMPACT MITIGATION NOT BEING IMPLEMENTED																					
Description	Without Mitigation	With Mitigation	<ul style="list-style-type: none"> • Demarcate the watercourse areas and buffer zones to limit disturbance, clearly mark these areas as no-go areas • Monitor the establishment of alien invasive species within the areas affected by the construction and take immediate corrective action where invasive species are observed to establish. 																						
Probability	Probable (3)	Improbable (2)																							
Duration	Long term (4)	Medium term (3)																							
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Magnitude	Moderate (6)	Moderate (6)																							
Significance	36 (Medium)	22 (Low)																							
Status (positive or negative)	Negative	Negative																							
<p>Nature of the Impact: <u>Changes in water quality due to foreign materials and increased nutrients.</u></p> <p>Source: Construction activities may result in the discharge of solvents and other industrial chemicals, leakage of fuel/oil from vehicles and the disposal of sewage resulting in the loss of sensitive biota in the wetlands/rivers and a reduction in watercourse function.</p> <table border="1"> <thead> <tr> <th>Description</th> <th>Without Mitigation</th> <th>With Mitigation</th> </tr> </thead> <tbody> <tr> <td>Probability</td> <td>Probable (3)</td> <td>Probable (3)</td> </tr> <tr> <td>Duration</td> <td>Long term (4)</td> <td>Medium term (3)</td> </tr> <tr> <td>Extent</td> <td>Local (2)</td> <td>Local (2)</td> </tr> <tr> <td>Magnitude</td> <td>Moderate (6)</td> <td>Moderate (6)</td> </tr> <tr> <td>Significance</td> <td>36 (Medium)</td> <td>33 (Medium)</td> </tr> <tr> <td>Status (positive or negative)</td> <td>Negative</td> <td>Negative</td> </tr> </tbody> </table>			Description	Without Mitigation	With Mitigation	Probability	Probable (3)	Probable (3)	Duration	Long term (4)	Medium term (3)	Extent	Local (2)	Local (2)	Magnitude	Moderate (6)	Moderate (6)	Significance	36 (Medium)	33 (Medium)	Status (positive or negative)	Negative	Negative	<ul style="list-style-type: none"> • Provision of adequate sanitation facilities located outside of the watercourse or its associated buffer zone. • Implementation of appropriate stormwater management around the excavation to prevent the ingress of run-off into the excavation and to prevent contaminated runoff into the watercourse. • The development footprint must be fenced off from the watercourses and no related impacts may be allowed into the watercourse e.g. water runoff from cleaning of equipment, vehicle access etc. • After construction, the land must be cleared of rubbish, surplus materials, and equipment, and all parts of the land shall be left in a condition as close as possible to that prior to use. • Maintenance of construction vehicles / equipment should not take place within the watercourse or watercourse buffer. • Maintenance of buffer zones to trap sediments with associated toxins • Treatment of pollution identified should be prioritized accordingly. 	<p>Expected to be limited provided that the mitigation measures are implemented correctly and effective rehabilitation of the site is undertaken where necessary.</p>
Description	Without Mitigation	With Mitigation																							
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POTENTIAL IMPACTS	PROPOSED MITIGATION	RISK OF THE IMPACT MITIGATION NOT BEING IMPLEMENTED																					
<p>Nature of the Impact: <u>Terrestrial and riverine fauna habitat destruction and loss of habitat connectivity.</u></p> <p>Only moderately sensitive environments for fauna are considered. The highly sensitive area is cordoned off and upstream and should not be impacted by the proposed activities. In general, activities in moderately sensitive areas are targeted along existing roads and bridges and should not further impact on connectivity. Any activities in moderately sensitive areas must commence in a manner that will reduce the duration of the impact and prevent downstream pollution and sedimentation.</p> <table border="1" data-bbox="190 805 813 1120"> <thead> <tr> <th>Description</th> <th>Without Mitigation</th> <th>With Mitigation</th> </tr> </thead> <tbody> <tr> <td>Probability</td> <td>Highly Probable (4)</td> <td>Probable (3)</td> </tr> <tr> <td>Duration</td> <td>Medium term (3)</td> <td>Short term (2)</td> </tr> <tr> <td>Extent</td> <td>Local (2)</td> <td>Site (1)</td> </tr> <tr> <td>Magnitude</td> <td>Moderate (6)</td> <td>Low (4)</td> </tr> <tr> <td>Significance</td> <td style="background-color: yellow;">44 (Medium)</td> <td style="background-color: green;">21 (Low)</td> </tr> <tr> <td>Status (positive or negative)</td> <td>Negative</td> <td>Negative</td> </tr> </tbody> </table>	Description	Without Mitigation	With Mitigation	Probability	Highly Probable (4)	Probable (3)	Duration	Medium term (3)	Short term (2)	Extent	Local (2)	Site (1)	Magnitude	Moderate (6)	Low (4)	Significance	44 (Medium)	21 (Low)	Status (positive or negative)	Negative	Negative	<ul style="list-style-type: none"> • Conduct activities during the dry season. • Peg out CBA and ESAs as no-go areas. • Peg out areas for trenches and contractors/ storage camp before commencing with activities to prevent disturbance to areas not targeted for development. 	<p>Limited</p>
Description	Without Mitigation	With Mitigation																					
Probability	Highly Probable (4)	Probable (3)																					
Duration	Medium term (3)	Short term (2)																					
Extent	Local (2)	Site (1)																					
Magnitude	Moderate (6)	Low (4)																					
Significance	44 (Medium)	21 (Low)																					
Status (positive or negative)	Negative	Negative																					
<p>Nature of the Impact: <u>Destruction of burrowing / fossorial fauna through excavation.</u></p> <p>The developed nature of the overall site means that much of the site has been affected by past developments and the potential for burrowing species to reside in the areas is unlikely</p>	<ul style="list-style-type: none"> • Peg out and demarcate areas for trench excavation and camp before commencing with excavation. • Maintain excavation and camp/storage areas as small as possible to limit the area of disturbance. • Stockpile excavated soil loosely along the trench and utilise as soon as pipeline is installed to reduce surface exposure of any 	<p>Limited</p>																					

POTENTIAL IMPACTS			PROPOSED MITIGATION	RISK OF THE IMPACT MITIGATION NOT BEING IMPLEMENTED																					
<p>and limited to species that have adapted to human settlements and disturbed environments.</p> <table border="1"> <thead> <tr> <th>Description</th> <th>Without Mitigation</th> <th>With Mitigation</th> </tr> </thead> <tbody> <tr> <td>Probability</td> <td>Improbable (2)</td> <td>Highly Improbable (1)</td> </tr> <tr> <td>Duration</td> <td>Short term (2)</td> <td>Temporary (1)</td> </tr> <tr> <td>Extent</td> <td>Site (1)</td> <td>Site (1)</td> </tr> <tr> <td>Magnitude</td> <td>Low (2)</td> <td>Low (2)</td> </tr> <tr> <td>Significance</td> <td>10 (Low)</td> <td>4 (Low)</td> </tr> <tr> <td>Status (positive or negative)</td> <td>Negative</td> <td>Negative</td> </tr> </tbody> </table>			Description	Without Mitigation	With Mitigation	Probability	Improbable (2)	Highly Improbable (1)	Duration	Short term (2)	Temporary (1)	Extent	Site (1)	Site (1)	Magnitude	Low (2)	Low (2)	Significance	10 (Low)	4 (Low)	Status (positive or negative)	Negative	Negative	<p>organisms within the stockpiles.</p> <ul style="list-style-type: none"> • Keep surface of stockpiles moist. • Maintain the substrate in surrounding areas in tact to provide source populations which can then repopulate rehabilitated areas. 	
Description	Without Mitigation	With Mitigation																							
Probability	Improbable (2)	Highly Improbable (1)																							
Duration	Short term (2)	Temporary (1)																							
Extent	Site (1)	Site (1)																							
Magnitude	Low (2)	Low (2)																							
Significance	10 (Low)	4 (Low)																							
Status (positive or negative)	Negative	Negative																							
<p>Nature of the Impact: <u>Destruction of Red-Listed fauna species.</u></p> <p>The nature of most of the site and the type of development means that the probability of TOP species occurring in activity areas at the time of activities is unlikely. Most TOPS are likely to retreat to the surrounding natural areas associated with the Hamberg Dam, which is cordoned off.</p> <table border="1"> <thead> <tr> <th>Description</th> <th>Without Mitigation</th> <th>With Mitigation</th> </tr> </thead> <tbody> <tr> <td>Probability</td> <td>Improbable (2)</td> <td>Highly Improbable (1)</td> </tr> <tr> <td>Duration</td> <td>Short term (2)</td> <td>Temporary (1)</td> </tr> <tr> <td>Extent</td> <td>Local (2)</td> <td>Site (1)</td> </tr> <tr> <td>Magnitude</td> <td>High (10)</td> <td>High (10)</td> </tr> <tr> <td>Significance</td> <td>28 (Low)</td> <td>12 (Low)</td> </tr> <tr> <td>Status (positive or negative)</td> <td>Negative</td> <td>Negative</td> </tr> </tbody> </table>			Description	Without Mitigation	With Mitigation	Probability	Improbable (2)	Highly Improbable (1)	Duration	Short term (2)	Temporary (1)	Extent	Local (2)	Site (1)	Magnitude	High (10)	High (10)	Significance	28 (Low)	12 (Low)	Status (positive or negative)	Negative	Negative	<ul style="list-style-type: none"> • Ensure all drivers on site and staff and contractors are informed of the importance of TOP species that may possibly occur on site through environmental awareness training. 	Limited
Description	Without Mitigation	With Mitigation																							
Probability	Improbable (2)	Highly Improbable (1)																							
Duration	Short term (2)	Temporary (1)																							
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POTENTIAL IMPACTS	PROPOSED MITIGATION	RISK OF THE IMPACT MITIGATION NOT BEING IMPLEMENTED																					
<p>Nature of the Impact: <u>Disturbance to fauna through noise, vibration, dust and emigration of fauna from site, and resulting influx of fauna to neighbouring areas.</u></p> <p>The existing nature of the site means that these impacts are taking place on a daily basis and the additional contribution by the proposed development will be minimal.</p> <table border="1" data-bbox="192 603 813 922"> <thead> <tr> <th>Description</th> <th>Without Mitigation</th> <th>With Mitigation</th> </tr> </thead> <tbody> <tr> <td>Probability</td> <td>Definite (5)</td> <td>Probable (3)</td> </tr> <tr> <td>Duration</td> <td>Short term (2)</td> <td>Temporary (1)</td> </tr> <tr> <td>Extent</td> <td>Site (1)</td> <td>Site (1)</td> </tr> <tr> <td>Magnitude</td> <td>Low (4)</td> <td>Low (2)</td> </tr> <tr> <td>Significance</td> <td>35 (Medium)</td> <td>12 (Low)</td> </tr> <tr> <td>Status (positive or negative)</td> <td>Negative</td> <td>Negative</td> </tr> </tbody> </table>	Description	Without Mitigation	With Mitigation	Probability	Definite (5)	Probable (3)	Duration	Short term (2)	Temporary (1)	Extent	Site (1)	Site (1)	Magnitude	Low (4)	Low (2)	Significance	35 (Medium)	12 (Low)	Status (positive or negative)	Negative	Negative	<ul style="list-style-type: none"> • Utilise quieter equipment where feasible. • Ensure dust suppression, through water sprinkling, is applied at time of high dust generation. • Any noisy point-sources utilised on site should be enclosed, and all equipment/ machinery fitted with silencers where applicable. • All equipment/ machinery will be serviced and maintained within operating specifications to prevent excessive noise. 	<p>Limited</p>
Description	Without Mitigation	With Mitigation																					
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Status (positive or negative)	Negative	Negative																					
<p>Nature of the Impact: <u>Attraction of pests and exotic/ alien species.</u></p> <p>The nature of the site means that several urbanised exotic and alien invasive species are already present in the area. Activities, such as leaving food and food waste out, could attract additional species or individuals to site which must at all costs be avoided. AIS out-compete local species and are a severe threat to biodiversity.</p> <table border="1" data-bbox="192 1310 813 1388"> <thead> <tr> <th>Description</th> <th>Without Mitigation</th> <th>With Mitigation</th> </tr> </thead> <tbody> <tr> <td>Probability</td> <td>Probable (3)</td> <td>Highly Improbable (1)</td> </tr> </tbody> </table>	Description	Without Mitigation	With Mitigation	Probability	Probable (3)	Highly Improbable (1)	<ul style="list-style-type: none"> • Compile and implement an alien invasive management plan in line with the municipal management plan, which must include measures to prevent attracting additional alien avifauna such as the common myna and house sparrow to site. This should include not feeding wild life and ensuring that all food and food waste is placed in sealed containers and not exposed on site. • Ensure that the outside areas are kept clean and tidy and provide adequate waste removal services for disposal of waste to prevent the attraction of exotic scavenging species to the site. • Inspect and clear waste from site on a daily basis. Maintaining and improving local indigenous populations creates competition 	<p>Limited</p>															
Description	Without Mitigation	With Mitigation																					
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POTENTIAL IMPACTS			PROPOSED MITIGATION	RISK OF THE IMPACT MITIGATION NOT BEING IMPLEMENTED																					
<i>Duration</i>	Long term (4)	Long term (4)	for invading species and could assist in reducing alien species numbers on site.																						
<i>Extent</i>	Local (2)	Local (2)																							
<i>Magnitude</i>	Moderate (6)	Moderate (6)																							
<i>Significance</i>	36 (Medium)	12 (Low)																							
<i>Status (positive or negative)</i>	Negative	Negative																							
<p>Nature of the Impact: <u>Hindrance, trapping, killing of fauna.</u></p> <p>Staff and contractors on site must undergo environmental awareness training which must include strict instruction on the prevention of deliberate trapping, killing, hindering of fauna in the area. This is applicable to all groups of fauna, from invertebrates to mammals. No indigenous animals are allowed to be caught under any circumstances, not even to for subsistence purposes.</p> <table border="1"> <thead> <tr> <th>Description</th> <th>Without Mitigation</th> <th>With Mitigation</th> </tr> </thead> <tbody> <tr> <td><i>Probability</i></td> <td>Improbable (2)</td> <td>Highly Improbable (1)</td> </tr> <tr> <td><i>Duration</i></td> <td>Short term (2)</td> <td>Temporary (1)</td> </tr> <tr> <td><i>Extent</i></td> <td>Local (2)</td> <td>Site (1)</td> </tr> <tr> <td><i>Magnitude</i></td> <td>High (8)</td> <td>High (8)</td> </tr> <tr> <td><i>Significance</i></td> <td>24 (Low)</td> <td>10 (Low)</td> </tr> <tr> <td><i>Status (positive or negative)</i></td> <td>Negative</td> <td>Negative</td> </tr> </tbody> </table>			Description	Without Mitigation	With Mitigation	<i>Probability</i>	Improbable (2)	Highly Improbable (1)	<i>Duration</i>	Short term (2)	Temporary (1)	<i>Extent</i>	Local (2)	Site (1)	<i>Magnitude</i>	High (8)	High (8)	<i>Significance</i>	24 (Low)	10 (Low)	<i>Status (positive or negative)</i>	Negative	Negative	<ul style="list-style-type: none"> All contractors on site must undergo environmental awareness training which must include the prohibition of any harm or hindrance to any indigenous fauna species. Ensure safe speed limits on the property. Contracts with contractors must specify actions that will be taken against contractors who do not conduct activities in line with the EMP. Should any indigenous fauna be inadvertently trapped within the development area or trenches, activities will cease and specialists brought in to safely remove the animals from site. 	Limited
Description	Without Mitigation	With Mitigation																							
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<i>Significance</i>	24 (Low)	10 (Low)																							
<i>Status (positive or negative)</i>	Negative	Negative																							
<p>Nature of the Impact: <u>Pollution of faunal environments and habitats through leaks and spills of hazardous substances (hydrocarbons and chemicals), littering and dumping of waste,</u></p>			<ul style="list-style-type: none"> Discontinue use of all faulty machinery/ equipment on site until properly repaired. Facilities will be provided for storage of all hazardous substances 	Medium																					

POTENTIAL IMPACTS	PROPOSED MITIGATION	RISK OF THE IMPACT MITIGATION NOT BEING IMPLEMENTED																					
<p><u>cement spills, sewage leaks including downstream impacts through run-off.</u></p> <p>All activity sites must be kept neat and tidy and all facilities must operate properly. Any pollution to the environment could leach and contaminate soils and groundwater, and could also contaminate downstream environments through storm-water run-off which will impact wetlands, aquatic ecology and water quality. Therefore ALL substances on site must be stored, handled and disposed of as prescribed by law and national or prescribed standards.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Description</th> <th style="text-align: center;">Without Mitigation</th> <th style="text-align: center;">With Mitigation</th> </tr> </thead> <tbody> <tr> <td>Probability</td> <td style="text-align: center;">Highly Probable (4)</td> <td style="text-align: center;">Improbable (2)</td> </tr> <tr> <td>Duration</td> <td style="text-align: center;">Permanent (5)</td> <td style="text-align: center;">Permanent (5)</td> </tr> <tr> <td>Extent</td> <td style="text-align: center;">Local (2)</td> <td style="text-align: center;">Site (1)</td> </tr> <tr> <td>Magnitude</td> <td style="text-align: center;">High (8)</td> <td style="text-align: center;">Moderate (6)</td> </tr> <tr> <td>Significance</td> <td style="text-align: center;">60 (Medium)</td> <td style="text-align: center;">24 (Low)</td> </tr> <tr> <td>Status (positive or negative)</td> <td style="text-align: center;">Negative</td> <td style="text-align: center;">Negative</td> </tr> </tbody> </table>	Description	Without Mitigation	With Mitigation	Probability	Highly Probable (4)	Improbable (2)	Duration	Permanent (5)	Permanent (5)	Extent	Local (2)	Site (1)	Magnitude	High (8)	Moderate (6)	Significance	60 (Medium)	24 (Low)	Status (positive or negative)	Negative	Negative	<p>and waste to prevent the exposure of these substances to the environment.</p> <ul style="list-style-type: none"> • Ensure no sewage leaks occur during pipe replacement by stopping flow or providing for diversions during replacement/ repair work. • Provide for adequate portable toilets for the number of staff on site and provide for male and female staff. • Keep portable toilets clean and hygienic and keep all facilities outside the flood lines and wetlands. • Portable toilets must be properly managed and emptied regularly to prevent overflow and leaks. • Waste (domestic, construction, hazardous) should be recycled as far as possible and sold/given to interested contractors. • Waste will be stored according to the Norms and Standards for Storage of Waste. • Recyclable waste should not be stored for excessive periods. • Refuse bins with properly secured lids will be placed around site to collect waste for separation, recycling and disposal. • All equipment / machinery will be serviced and maintained within operating specifications to prevent the risks of leak. • Repairs to vehicles will be conducted off-site and where this is not possible the underlying ground will be covered with impermeable sheet and pans. • Due to proximity of petrol stations, hydrocarbon storage on site should be limited. • All oily rags and oil-contaminated containers will be placed in the 	
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POTENTIAL IMPACTS	PROPOSED MITIGATION	RISK OF THE IMPACT MITIGATION NOT BEING IMPLEMENTED
	<p>hazardous used-hydrocarbon drums for disposal to a hazardous waste facility.</p> <ul style="list-style-type: none"> • Any machinery or equipment parked on site will either be parked on a concrete slab or have pans placed under them to collect all drips and potential leaks. • Cement bags will be stored under a tarpaulin and on an impervious sheet. • Cement mixing will take place within a designated area outside the flood-line and over tray or sheeting with bunding to prevent spills onto bare ground. • Inspect and clear all litter and waste from the site and surrounds. • All hydrocarbons spills on bare ground will be cleared immediately. • This will include the lifting of contaminated soil for bio-remediation or disposal to a hazardous waste facility. • All dry and wet cement spills on bare ground will be cleared immediately. • Remove all materials and waste from site on departing the area. • Leave no materials behind and ensure all earth material (any excavated earth) has been levelled and rehabilitated. 	
<p>Nature of the Impact: <u>Clearing of vegetation.</u></p> <p>The construction may require the removal of the modified grassland that serve as catchment and buffer to the riparian vegetation. If these impacts are foreseen, it can be mitigated. Secondary grassland vegetation along the Bennie Reinecke</p>	<ul style="list-style-type: none"> • Preferably, no construction camps or storage of equipment must be planned within the secondary grassland west of Minnaar Street, upslope from the <i>Phragmites australis</i> wetland area. If unavoidable, the area must be fenced and edge effects prevented. • An independent Ecological Control Officer (ECO) should be 	<p>Limited</p>

POTENTIAL IMPACTS	PROPOSED MITIGATION	RISK OF THE IMPACT MITIGATION NOT BEING IMPLEMENTED																					
<p>Park boundary wall will be removed for the pipeline.</p> <p>Source:</p> <ul style="list-style-type: none"> Clearing of and damage to vegetation in construction footprint, access roads, construction camps, vehicle / machinery traffic and trampling by workers. Illegal disposal and dumping of construction material such as cement or oil, as well as maintenance materials during construction. <table border="1" data-bbox="192 722 813 1038"> <thead> <tr> <th>Description</th> <th>Without Mitigation</th> <th>With Mitigation</th> </tr> </thead> <tbody> <tr> <td>Probability</td> <td>Probable (3)</td> <td>Improbable (2)</td> </tr> <tr> <td>Duration</td> <td>Medium term (3)</td> <td>Short term (2)</td> </tr> <tr> <td>Extent</td> <td>Local (2)</td> <td>Site (1)</td> </tr> <tr> <td>Magnitude</td> <td>High (8)</td> <td>Moderate (6)</td> </tr> <tr> <td>Significance</td> <td>39 (Medium)</td> <td>18 (Low)</td> </tr> <tr> <td>Status (positive or negative)</td> <td>Negative</td> <td>Negative</td> </tr> </tbody> </table>	Description	Without Mitigation	With Mitigation	Probability	Probable (3)	Improbable (2)	Duration	Medium term (3)	Short term (2)	Extent	Local (2)	Site (1)	Magnitude	High (8)	Moderate (6)	Significance	39 (Medium)	18 (Low)	Status (positive or negative)	Negative	Negative	<p>appointed to oversee construction.</p> <ul style="list-style-type: none"> Prohibit vehicular or pedestrian access into natural areas beyond the demarcated boundary of the construction area or any semi-natural natural areas outside of the construction. Only remove vegetation where absolutely necessary and retain vegetation in place for as long as possible prior to removal. A vegetation rehabilitation plan should already be implemented during construction and include the following: Secondary grassland that needs to be cleared can be removed as sods and stored within disturbed areas. The sods must preferably be removed during the winter months and be replanted by latest springtime. The sods should not be stacked on top of each other. Once construction is completed, these sods should be used to rehabilitate the disturbed areas from where they have been removed. In the absence of timely rainfall, the sods should be watered well after planting and at least twice more over the next 2 weeks. Grasses that naturally occur in the area should be sown/ hydro-seeded in the disturbed footprint. Construction workers may not remove flora and neither may anyone collect seed from the plants without permission from the local authority. No activities should take place during rainy events and at least 2 days afterwards. Where topsoil needs to be removed, store such in a separate area where such soils can be protected until they can be re-used 	
Description	Without Mitigation	With Mitigation																					
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POTENTIAL IMPACTS	PROPOSED MITIGATION	RISK OF THE IMPACT MITIGATION NOT BEING IMPLEMENTED																					
	<p>for post-construction rehabilitation where applicable. Never mix topsoil with subsoils or other spoil materials.</p> <ul style="list-style-type: none"> • Maintain site demarcations in position until the cessation of construction work. • After construction, the land must be cleared of rubbish, surplus materials, and equipment, and all parts of the land must be left in a condition as close as possible to that prior to construction. 																						
<p>Nature of the Impact: <u>Destruction or degradation of vegetation associated with watercourses and moist grassland.</u></p> <p>The construction of the pipeline will inevitably require the removal of moist grassland and riparian vegetation or at least some edge effects onto these. This will impact on the health and functioning of the vegetation within the watercourse. Construction could also result in pollution of the watercourse.</p> <table border="1" data-bbox="192 933 813 1251"> <thead> <tr> <th>Description</th> <th>Without Mitigation</th> <th>With Mitigation</th> </tr> </thead> <tbody> <tr> <td>Probability</td> <td>Definite (5)</td> <td>Probable (3)</td> </tr> <tr> <td>Duration</td> <td>Medium term (3)</td> <td>Short term (2)</td> </tr> <tr> <td>Extent</td> <td>Local (2)</td> <td>Local (2)</td> </tr> <tr> <td>Magnitude</td> <td>High (8)</td> <td>Moderate (6)</td> </tr> <tr> <td>Significance</td> <td style="background-color: red; color: white;">65 (High)</td> <td style="background-color: green; color: white;">30 (Low)</td> </tr> <tr> <td>Status (positive or negative)</td> <td>Negative</td> <td>Negative</td> </tr> </tbody> </table>	Description	Without Mitigation	With Mitigation	Probability	Definite (5)	Probable (3)	Duration	Medium term (3)	Short term (2)	Extent	Local (2)	Local (2)	Magnitude	High (8)	Moderate (6)	Significance	65 (High)	30 (Low)	Status (positive or negative)	Negative	Negative	<ul style="list-style-type: none"> • No activities may proceed within or in proximity to watercourses without a Water Use License permitting the activity. • Construction mitigation as per above. • The wetland and associated buffer zones as delineated by a wetland specialist should be fenced during the construction phase to prevent any human activity from encroaching into these areas, other than that which is essential to the construction. Monitoring of the fences is important to ensure no infringement of the fences occurs. • Construction within the wetland should preferably take place during the dry winter months. • Input of sediment during construction activities should be prevented at all cost. Mitigation for this potential impact includes establishment of vegetation as soon as possible after construction. • Pollution of the surface and groundwater. Mitigation for this potential impact includes: <ul style="list-style-type: none"> ▪ In the case of pollution of any surface or groundwater, the Regional Representative of the Department of Water 	<p>High risk</p>
Description	Without Mitigation	With Mitigation																					
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POTENTIAL IMPACTS	PROPOSED MITIGATION	RISK OF THE IMPACT MITIGATION NOT BEING IMPLEMENTED
	<p>and Sanitation must be informed immediately.</p> <ul style="list-style-type: none"> ▪ Store all litter carefully so it cannot be washed or blown into the water course. ▪ Construction vehicles are to be maintained in good working order so as to reduce the probability of leakage of fuels and lubricants. ▪ A walled concrete platform, dedicated store with adequate flooring or bermed area should be used to accommodate chemicals such as fuel, oil, paint, herbicide and insecticides, as appropriate, in well-ventilated areas. ▪ Storage of potentially hazardous materials should be above any 100-year flood line or the functional wetland boundary (and its associated buffer zone). These materials include fuel, oil, cement, bitumen etc. ▪ Surface water draining off contaminated areas containing oil and petrol would need to be channelled towards a sump which will separate these chemicals and oils. ▪ Concrete is to be mixed on mixing trays only, not on exposed soil. ▪ Concrete and tar shall be mixed only in areas which have been specially demarcated for this purpose. ▪ After all the concrete/ tar mixing is complete all waste concrete/ tar shall be removed from the batching area and disposed of at an approved dumpsite. ▪ All construction materials liable to spillage are to be 	

POTENTIAL IMPACTS	PROPOSED MITIGATION	RISK OF THE IMPACT MITIGATION NOT BEING IMPLEMENTED																					
	<p>stored in appropriate structures with impermeable flooring; Portable septic toilets are to be provided and maintained for construction crews. Maintenance must include their removal without sewage spillage.</p> <ul style="list-style-type: none"> ▪ Under no circumstances may ablutions occur outside of the provided facilities. ▪ No uncontrolled discharges from the construction crew camps to any surface water resources shall be permitted. Any discharge points need to be approved by the relevant authority. <ul style="list-style-type: none"> • Ensure that the vegetation disturbed during construction is rehabilitated. 																						
<p>Nature of the Impact: <u>Destruction of protected plants and plants of conservation concern.</u></p> <p>Construction will likely impact on the <i>Crinum bulbispermum</i> recorded within the modified / built-up vegetation.</p> <table border="1" data-bbox="192 1015 813 1329"> <thead> <tr> <th>Description</th> <th>Without Mitigation</th> <th>With Mitigation</th> </tr> </thead> <tbody> <tr> <td>Probability</td> <td>Probable (3)</td> <td>Improbable (2)</td> </tr> <tr> <td>Duration</td> <td>Permanent (5)</td> <td>Short term (2)</td> </tr> <tr> <td>Extent</td> <td>Site (1)</td> <td>Site (1)</td> </tr> <tr> <td>Magnitude</td> <td>High (8)</td> <td>Moderate (6)</td> </tr> <tr> <td>Significance</td> <td style="background-color: yellow;">42 (Medium)</td> <td style="background-color: green;">18 (Low)</td> </tr> <tr> <td>Status (positive or negative)</td> <td>Negative</td> <td>Negative</td> </tr> </tbody> </table>	Description	Without Mitigation	With Mitigation	Probability	Probable (3)	Improbable (2)	Duration	Permanent (5)	Short term (2)	Extent	Site (1)	Site (1)	Magnitude	High (8)	Moderate (6)	Significance	42 (Medium)	18 (Low)	Status (positive or negative)	Negative	Negative	<ul style="list-style-type: none"> • The Declining plant species should either be avoided by the route or relocated. The species can also be replanted as part of rehabilitation. • The species can only be removed once a permit for the removal or relocation of such species is granted by the GDARD. • Protected plants must be removed by a suitably qualified specialist and replanted in suitable habitat such as the buffer areas of the moist grasslands. Their survival must be monitored for at least two growing seasons after relocation. • Construction workers may not tamper or remove these plants, and neither may anyone collect seed from the plants without permission from the local authority. 	<p>Medium risk</p>
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Significance	42 (Medium)	18 (Low)																					
Status (positive or negative)	Negative	Negative																					
<p>Nature of the Impact: <u>Potential increase in invasive</u></p>	<ul style="list-style-type: none"> • Alien invasive species, in particular category 1b species that 	<p>Medium risk</p>																					

POTENTIAL IMPACTS	PROPOSED MITIGATION	RISK OF THE IMPACT MITIGATION NOT BEING IMPLEMENTED																					
<p><u>vegetation.</u></p> <p>The seed of alien invasive plant species that occur on and in the vicinity of the construction areas could spread into the disturbed and stockpiled soil. Also, the construction vehicles and equipment were likely used on various other sites and could introduce alien invasive plant seeds or indigenous plants not belonging to this vegetation unit to the construction site.</p> <table border="1" data-bbox="190 643 813 959"> <thead> <tr> <th>Description</th> <th>Without Mitigation</th> <th>With Mitigation</th> </tr> </thead> <tbody> <tr> <td>Probability</td> <td>Highly Probable (4)</td> <td>Probable (3)</td> </tr> <tr> <td>Duration</td> <td>Long term (4)</td> <td>Medium term (2)</td> </tr> <tr> <td>Extent</td> <td>Local (2)</td> <td>Site (1)</td> </tr> <tr> <td>Magnitude</td> <td>High (8)</td> <td>Moderate (6)</td> </tr> <tr> <td>Significance</td> <td style="background-color: yellow;">56 (Medium)</td> <td style="background-color: green;">27 (Low)</td> </tr> <tr> <td>Status (positive or negative)</td> <td>Negative</td> <td>Negative</td> </tr> </tbody> </table>	Description	Without Mitigation	With Mitigation	Probability	Highly Probable (4)	Probable (3)	Duration	Long term (4)	Medium term (2)	Extent	Local (2)	Site (1)	Magnitude	High (8)	Moderate (6)	Significance	56 (Medium)	27 (Low)	Status (positive or negative)	Negative	Negative	<p>were identified on site must be removed from the development footprint and immediate surrounds, prior to construction or soil disturbances. By removing these species, the spread of seeds will be prevented into disturbed soils which could thus have a positive impact on the surrounding natural vegetation.</p> <ul style="list-style-type: none"> • All alien seedlings and saplings must be removed as they become evident for the duration of construction. • All construction vehicles and equipment, as well as construction material should be free of plant material. Therefore, all equipment and vehicles should be thoroughly cleaned prior to access on to the construction areas. This should be verified by the ECO. • If filling material is to be used, this should be sourced from areas free of invasive species. 	
Description	Without Mitigation	With Mitigation																					
Probability	Highly Probable (4)	Probable (3)																					
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Magnitude	High (8)	Moderate (6)																					
Significance	56 (Medium)	27 (Low)																					
Status (positive or negative)	Negative	Negative																					
<p>Nature of the Impact: <u>Clearing of land for construction camps and potential pollution of the soil and water.</u></p> <p>These may be at one or several locations, area will be cleared and levelled where necessary, site offices may be temporary structures, machinery, building supplies and temporary staff facilities (excluding accommodation) will be housed here. The impacts could include:</p> <ul style="list-style-type: none"> • Removal of vegetation. • Levelling and compaction of soils. 	<ul style="list-style-type: none"> • Construction camps must not be located in proximity to the <i>Phragmites australis</i> wetland. • Prevent spillage of construction material and other pollutants, contain and treat any spillages immediately, strictly prohibit any pollution/littering. Ensure there is a method statement in place to remedy any accidental spillages immediately. • No open fires may be lit for cooking or any other purposes, unless in specifically designated and secured areas. • No vehicles may be washed on site, except in suitably designed and protected areas. 	<p>Medium risk</p>																					

POTENTIAL IMPACTS	PROPOSED MITIGATION	RISK OF THE IMPACT MITIGATION NOT BEING IMPLEMENTED																					
<ul style="list-style-type: none"> Storage of machinery, supplies and staff facilities. <p>This could lead to the loss of vegetation and/or species of conservation concern, alteration and loss of microhabitats, altered vegetation cover, increased erosion and contamination of soil and groundwater.</p> <table border="1" data-bbox="190 564 813 879"> <thead> <tr> <th>Description</th> <th>Without Mitigation</th> <th>With Mitigation</th> </tr> </thead> <tbody> <tr> <td>Probability</td> <td>Probable (3)</td> <td>Improbable (2)</td> </tr> <tr> <td>Duration</td> <td>Long term (4)</td> <td>Medium term (3)</td> </tr> <tr> <td>Extent</td> <td>Local (2)</td> <td>Site (1)</td> </tr> <tr> <td>Magnitude</td> <td>Moderate (6)</td> <td>Moderate (6)</td> </tr> <tr> <td>Significance</td> <td style="background-color: yellow;">36 (Medium)</td> <td style="background-color: green;">20 (Low)</td> </tr> <tr> <td>Status (positive or negative)</td> <td>Negative</td> <td>Negative</td> </tr> </tbody> </table>	Description	Without Mitigation	With Mitigation	Probability	Probable (3)	Improbable (2)	Duration	Long term (4)	Medium term (3)	Extent	Local (2)	Site (1)	Magnitude	Moderate (6)	Moderate (6)	Significance	36 (Medium)	20 (Low)	Status (positive or negative)	Negative	Negative	<ul style="list-style-type: none"> No vehicles may be serviced or repaired on the property, unless it is an emergency situation in which case adequate spillage containment must be implemented. 	
Description	Without Mitigation	With Mitigation																					
Probability	Probable (3)	Improbable (2)																					
Duration	Long term (4)	Medium term (3)																					
Extent	Local (2)	Site (1)																					
Magnitude	Moderate (6)	Moderate (6)																					
Significance	36 (Medium)	20 (Low)																					
Status (positive or negative)	Negative	Negative																					
<p>Nature of the Impact: <u>Exposure to erosion and subsequent sedimentation or pollution of proximate watercourses.</u></p> <p>The removal of surface vegetation will expose the soils, which in rainy events would wash down into the watercourses, causing sedimentation. In addition, indigenous vegetation communities are unlikely to colonise eroded soils successfully and seeds from proximate alien invasive plant species can spread easily into these eroded soils. After construction, a lack of rehabilitation or failed rehabilitation will result in bare soils that are susceptible to erosion. The sources of this impact include:</p> <ul style="list-style-type: none"> Removal of vegetation in proximity to the moist 	<ul style="list-style-type: none"> Do not allow erosion to develop on a large scale before taking action. Where possible, no construction / activities should be undertaken within the riparian or moist grassland areas. The extent of wetland conditions should be verified by a wetland specialist and no activities should take place within these areas without that a Water Use License was granted by the Department of Water Affairs (DWA) for these activities. Retain vegetation and soil in position for as long as possible, removing it immediately ahead of construction / earthworks in that area (DWAF, 2005). Runoff from road must be managed to avoid erosion and 	<p>Medium risk</p>																					

POTENTIAL IMPACTS	PROPOSED MITIGATION	RISK OF THE IMPACT MITIGATION NOT BEING IMPLEMENTED																					
<p>grassland or riparian area, without proper rehabilitation or failure of rehabilitation.</p> <ul style="list-style-type: none"> • Access roads, especially on slopes, channels rainfall and causes erosion. • Lack of rehabilitation or failed rehabilitation. • Maintenance vehicles disturbing rehabilitated areas. • Spillages of construction material and harmful chemicals. • Failure of rehabilitation of the construction footprint. <table border="1" data-bbox="192 683 815 1002"> <thead> <tr> <th>Description</th> <th>Without Mitigation</th> <th>With Mitigation</th> </tr> </thead> <tbody> <tr> <td>Probability</td> <td>Highly Probable (4)</td> <td>Probable (3)</td> </tr> <tr> <td>Duration</td> <td>Long term (4)</td> <td>Medium term (3)</td> </tr> <tr> <td>Extent</td> <td>Local (2)</td> <td>Site (1)</td> </tr> <tr> <td>Magnitude</td> <td>High (8)</td> <td>Low (4)</td> </tr> <tr> <td>Significance</td> <td style="background-color: yellow;">56 (Medium)</td> <td style="background-color: green;">24 (Low)</td> </tr> <tr> <td>Status (positive or negative)</td> <td>Negative</td> <td>Negative</td> </tr> </tbody> </table>	Description	Without Mitigation	With Mitigation	Probability	Highly Probable (4)	Probable (3)	Duration	Long term (4)	Medium term (3)	Extent	Local (2)	Site (1)	Magnitude	High (8)	Low (4)	Significance	56 (Medium)	24 (Low)	Status (positive or negative)	Negative	Negative	<p>pollution problems.</p> <ul style="list-style-type: none"> • Ensure that runoff from compacted or sealed surfaces is slowed down and dispersed sufficiently to prevent accelerated erosion from being initiated (erosion management plan required) • Colonisation of the disturbed areas by plants species from the surrounding natural vegetation must be monitored to ensure that indigenous vegetation cover is sufficient within one growing season. Due to the high degree of invasive species in the area, it is active rehabilitation e.g. hydroseeding is recommended, along with an alien invasive management plan. • Protect all areas susceptible to erosion and ensure that there is no undue soil erosion resultant from activities within and adjacent to the construction camp and work areas. • After construction clear any temporarily impacted areas of all foreign materials, re-apply and/or loosen topsoils and landscape to surrounding level. 	
Description	Without Mitigation	With Mitigation																					
Probability	Highly Probable (4)	Probable (3)																					
Duration	Long term (4)	Medium term (3)																					
Extent	Local (2)	Site (1)																					
Magnitude	High (8)	Low (4)																					
Significance	56 (Medium)	24 (Low)																					
Status (positive or negative)	Negative	Negative																					
<p>Nature of the Impact: <u>Loss and disturbance of heritage sites due to the development.</u></p> <table border="1" data-bbox="192 1129 815 1375"> <thead> <tr> <th>Description</th> <th>Without Mitigation</th> <th>With Mitigation</th> </tr> </thead> <tbody> <tr> <td>Probability</td> <td>Very improbable (1)</td> <td>Very improbable (1)</td> </tr> <tr> <td>Duration</td> <td>Permanent (4)</td> <td>Permanent (4)</td> </tr> <tr> <td>Extent</td> <td>Site (1)</td> <td>Site (1)</td> </tr> <tr> <td>Magnitude</td> <td>Minor (2)</td> <td>Minor (2)</td> </tr> <tr> <td>Significance</td> <td style="background-color: green;">7 (Low)</td> <td style="background-color: green;">7 (Low)</td> </tr> </tbody> </table>	Description	Without Mitigation	With Mitigation	Probability	Very improbable (1)	Very improbable (1)	Duration	Permanent (4)	Permanent (4)	Extent	Site (1)	Site (1)	Magnitude	Minor (2)	Minor (2)	Significance	7 (Low)	7 (Low)	<ul style="list-style-type: none"> • Should graves, fossils or any archaeological artefacts be identified during construction, work on the area where the artefacts were found, must cease immediately and it should immediately be reported to a heritage practitioner or local museum so that an investigation and evaluation of the finds can be made. 	<p>Low risk anticipated provided that the mitigation measures are implemented correctly.</p>			
Description	Without Mitigation	With Mitigation																					
Probability	Very improbable (1)	Very improbable (1)																					
Duration	Permanent (4)	Permanent (4)																					
Extent	Site (1)	Site (1)																					
Magnitude	Minor (2)	Minor (2)																					
Significance	7 (Low)	7 (Low)																					

POTENTIAL IMPACTS			PROPOSED MITIGATION	RISK OF THE IMPACT MITIGATION NOT BEING IMPLEMENTED
<i>Status (positive or negative)</i>	Negative	Negative		
<p>As no sites, features or objects of cultural significance are known to exist in the development area, there would be no impact as a result of the proposed development.</p>				
<p>Nature of Impact: <u>Visual</u></p> <p>Surface disturbances and the presence of a construction team are uncharacteristic events in the study area and may cause unsightly views as a result of the activity.</p> <p>Introduction of construction equipment, ground staff, construction vehicles and equipment that is unfamiliar in the baseline environment.</p> <p>Source of Impact:</p> <ul style="list-style-type: none"> • Construction vehicles. • Construction material. • Barricading and fencing. • Rubble on site. • Construction crew. 			<ul style="list-style-type: none"> • Construction vehicles should only park in designated areas. • Waste to be kept only at specific sites on site and to be removed weekly. • Do not locate the construction camp or laydown yards within 1km from any residential area or tourist attraction, unless it can be completely screened from sensitive viewpoints. Preferably, construction camps should be in a dedicated construction camp in the industrial area, in an area that is already disturbed. • Avoid the construction of additional access roads by keeping to existing roads where possible. • Avoid removal of any large trees or shrubs that may open views to the construction site and compromise the natural screening capacity of the study area. • Clearly demarcate the construction site to limit the area of disturbance. • Keep dust levels down by regularly wetting dirt roads and exposed soil areas. • Remove rubble and other waste that is generated by the construction process as soon as possible and dispose at an appropriate dump site. 	<p>The site will not be visually appealing during the construction phase.</p>
Description	Without Mitigation	With Mitigation		
<i>Probability</i>	Definite (5)	Highly Probable (4)		
<i>Duration</i>	Long term (4)	Medium term (3)		
<i>Extent</i>	Site (1)	Site (1)		
<i>Magnitude</i>	High (8)	Moderate (6)		

POTENTIAL IMPACTS			PROPOSED MITIGATION	RISK OF THE IMPACT MITIGATION NOT BEING IMPLEMENTED																					
<i>Significance</i>	65 (High)	40 (Medium)	<ul style="list-style-type: none"> Keep the construction camp neat and tidy at all times. Remove any waste from the site or contain it in an enclosed area out of sight from sensitive viewpoints. Enhance screening of the construction camps by erecting a temporary fence with a 3m high shade cloth to limit the intrusive nature of such a site. 																						
<i>Status (positive or negative)</i>	Negative	Negative																							
<p>Nature of Impact: <u>Dust Generation</u></p> <p>Construction machinery and heavy vehicles which are likely to make use of the existing gravel roads to transport equipment and material to the construction site, are likely to generate dust which is likely to be perceptible by adjacent residents. Trucks may potentially distribute dust along internal access roads as well as into the watercourse given the nature of the activities.</p> <p>Source of Impact:</p> <ul style="list-style-type: none"> Clearing of vegetation. Construction vehicles. <table border="1"> <thead> <tr> <th>Description</th> <th>Without Mitigation</th> <th>With Mitigation</th> </tr> </thead> <tbody> <tr> <td><i>Probability</i></td> <td>Definite (5)</td> <td>Probable (3)</td> </tr> <tr> <td><i>Duration</i></td> <td>Long term (4)</td> <td>Medium term (3)</td> </tr> <tr> <td><i>Extent</i></td> <td>Local (2)</td> <td>Local (2)</td> </tr> <tr> <td><i>Magnitude</i></td> <td>High (8)</td> <td>Moderate (6)</td> </tr> <tr> <td><i>Significance</i></td> <td>70 (High)</td> <td>33 (Medium)</td> </tr> <tr> <td><i>Status (positive or negative)</i></td> <td>Negative</td> <td>Negative</td> </tr> </tbody> </table>			Description	Without Mitigation	With Mitigation	<i>Probability</i>	Definite (5)	Probable (3)	<i>Duration</i>	Long term (4)	Medium term (3)	<i>Extent</i>	Local (2)	Local (2)	<i>Magnitude</i>	High (8)	Moderate (6)	<i>Significance</i>	70 (High)	33 (Medium)	<i>Status (positive or negative)</i>	Negative	Negative	<ul style="list-style-type: none"> Vegetation clearance should be kept to a minimum (only where necessary). Wet all unprotected cleared areas and stockpiles with water to suppress dust pollution during dry and windy periods. Warning barricading should be placed around open trenches and should be suitable for high winds. Speed limits should be enforced to ensure that the generation of dust by construction vehicles are limited. Dust suppression at least twice a day; morning and before the end of the working day. A continuous dust monitoring process needs to be undertaken during construction. All vehicles transporting friable materials such a sand, rubble etc must be covered by a tarpaulin or wet down. Construction work to be undertaken during weekdays as far as practical. 	Medium risk (as the amount of dust emitted into the air will be of high volumes); unless mitigation measures are implemented.
Description	Without Mitigation	With Mitigation																							
<i>Probability</i>	Definite (5)	Probable (3)																							
<i>Duration</i>	Long term (4)	Medium term (3)																							
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<i>Significance</i>	70 (High)	33 (Medium)																							
<i>Status (positive or negative)</i>	Negative	Negative																							

POTENTIAL IMPACTS	PROPOSED MITIGATION	RISK OF THE IMPACT MITIGATION NOT BEING IMPLEMENTED																					
<p>Nature of Impact: <u>Crime, safety and security</u></p> <p>Source of Impact:</p> <ul style="list-style-type: none"> • Lack of security. • Easy access. • Construction area not enclosed. • Poorly trained personnel using equipment and vehicles. <table border="1" data-bbox="192 630 813 946"> <thead> <tr> <th>Description</th> <th>Without Mitigation</th> <th>With Mitigation</th> </tr> </thead> <tbody> <tr> <td>Probability</td> <td>Highly Probable (4)</td> <td>Probable (3)</td> </tr> <tr> <td>Duration</td> <td>Long term (4)</td> <td>Medium term (3)</td> </tr> <tr> <td>Extent</td> <td>Local (2)</td> <td>Local (2)</td> </tr> <tr> <td>Magnitude</td> <td>Moderate (6)</td> <td>Low (4)</td> </tr> <tr> <td>Significance</td> <td>48 (Medium)</td> <td>27 (Low)</td> </tr> <tr> <td>Status (positive or negative)</td> <td>Negative</td> <td>Negative</td> </tr> </tbody> </table>	Description	Without Mitigation	With Mitigation	Probability	Highly Probable (4)	Probable (3)	Duration	Long term (4)	Medium term (3)	Extent	Local (2)	Local (2)	Magnitude	Moderate (6)	Low (4)	Significance	48 (Medium)	27 (Low)	Status (positive or negative)	Negative	Negative	<ul style="list-style-type: none"> • Ensure that the construction vehicles as well as equipment are under the control of competent personnel and are in proper working order. • Ensure that the contact details of the police or security company and ambulance services are available on site. • Limit access to the construction camp to construction workers through access control. • Comply with the requirements of the Occupational Health and Safety Act, 1993 (Act No.85 of 1993) requirements. • Ensure that the handling of equipment and materials is supervised and adequately instructed. • Vehicular traffic during construction activities must be limited to a maximum speed limit of 30 km/hr. • The security fence around the development site must be completed before construction commences internally. 	<p>If not mitigated, medium risk to personnel as well as the construction site if safety measures are not put in place before construction commences.</p>
Description	Without Mitigation	With Mitigation																					
Probability	Highly Probable (4)	Probable (3)																					
Duration	Long term (4)	Medium term (3)																					
Extent	Local (2)	Local (2)																					
Magnitude	Moderate (6)	Low (4)																					
Significance	48 (Medium)	27 (Low)																					
Status (positive or negative)	Negative	Negative																					
<p>Nature of Impact: <u>Noise</u></p> <p>Source of Impact:</p> <ul style="list-style-type: none"> • Construction vehicles. • Equipment and machinery. <table border="1" data-bbox="192 1169 813 1372"> <thead> <tr> <th>Description</th> <th>Without Mitigation</th> <th>With Mitigation</th> </tr> </thead> <tbody> <tr> <td>Probability</td> <td>Definite (5)</td> <td>Definite (5)</td> </tr> <tr> <td>Duration</td> <td>Long term (4)</td> <td>Medium term (3)</td> </tr> <tr> <td>Extent</td> <td>Local (2)</td> <td>Local (2)</td> </tr> <tr> <td>Magnitude</td> <td>High (8)</td> <td>Moderate (6)</td> </tr> </tbody> </table>	Description	Without Mitigation	With Mitigation	Probability	Definite (5)	Definite (5)	Duration	Long term (4)	Medium term (3)	Extent	Local (2)	Local (2)	Magnitude	High (8)	Moderate (6)	<ul style="list-style-type: none"> • Construction and the use of construction machinery should be limited between 06h00 and 18h00 on weekdays only. • Institute noise control measures throughout the construction phase for all applicable activities, including the construction times. • Ensure that noise licensers are installed on the construction vehicles and machineries to reduce the noise level. • Inform residents of nearby residential areas of planned noisy activities outside the timeframes stated above. • No construction should occur during weekends, unless the 	<p>High risk as construction vehicles and equipment causes noise pollution.</p>						
Description	Without Mitigation	With Mitigation																					
Probability	Definite (5)	Definite (5)																					
Duration	Long term (4)	Medium term (3)																					
Extent	Local (2)	Local (2)																					
Magnitude	High (8)	Moderate (6)																					

POTENTIAL IMPACTS			PROPOSED MITIGATION	RISK OF THE IMPACT MITIGATION NOT BEING IMPLEMENTED																					
<i>Significance</i>	70 (High)	55 (Medium)	adjacent residents have been notified in writing at least three days in advance. <ul style="list-style-type: none"> Construction activities must abide by the national noise laws and the municipal noise by-laws with regard to the abatement of noise caused by mechanical equipment. 																						
<i>Status (positive or negative)</i>	Negative	Negative																							
Nature of impact: <u>Traffic and accessibility</u> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Description</th> <th>Without Mitigation</th> <th>With Mitigation</th> </tr> </thead> <tbody> <tr> <td><i>Probability</i></td> <td>Definite (5)</td> <td>Highly Probable (4)</td> </tr> <tr> <td><i>Duration</i></td> <td>Long term (4)</td> <td>Medium term (3)</td> </tr> <tr> <td><i>Extent</i></td> <td>Local (2)</td> <td>Local (2)</td> </tr> <tr> <td><i>Magnitude</i></td> <td>Moderate (6)</td> <td>Moderate (6)</td> </tr> <tr> <td><i>Significance</i></td> <td style="background-color: yellow;">60 (Medium)</td> <td style="background-color: yellow;">44 (Medium)</td> </tr> <tr> <td><i>Status (positive or negative)</i></td> <td>Negative</td> <td>Negative</td> </tr> </tbody> </table>			Description	Without Mitigation	With Mitigation	<i>Probability</i>	Definite (5)	Highly Probable (4)	<i>Duration</i>	Long term (4)	Medium term (3)	<i>Extent</i>	Local (2)	Local (2)	<i>Magnitude</i>	Moderate (6)	Moderate (6)	<i>Significance</i>	60 (Medium)	44 (Medium)	<i>Status (positive or negative)</i>	Negative	Negative	<ul style="list-style-type: none"> Traffic accommodation for construction activities affecting the travelled way as well as the sidewalks of the travelled way. If one lane is expected to be closed, "Stop and Go" will be used for traffic accommodation. In the case of complete road closure, traffic diversion must be accommodated for. 	High risk
Description	Without Mitigation	With Mitigation																							
<i>Probability</i>	Definite (5)	Highly Probable (4)																							
<i>Duration</i>	Long term (4)	Medium term (3)																							
<i>Extent</i>	Local (2)	Local (2)																							
<i>Magnitude</i>	Moderate (6)	Moderate (6)																							
<i>Significance</i>	60 (Medium)	44 (Medium)																							
<i>Status (positive or negative)</i>	Negative	Negative																							
Nature of impact: <u>Socioeconomic</u> Source of Impact: <ul style="list-style-type: none"> Job creation for local skilled labour, general labour and suppliers. <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Description</th> <th>Without Enhancement</th> <th>With Enhancement</th> </tr> </thead> <tbody> <tr> <td><i>Probability</i></td> <td>Probable (3)</td> <td>Highly Probable (4)</td> </tr> <tr> <td><i>Duration</i></td> <td>Long term (4)</td> <td>Medium term (3)</td> </tr> <tr> <td><i>Extent</i></td> <td>Local (2)</td> <td>Local (2)</td> </tr> <tr> <td><i>Magnitude</i></td> <td>Low (4)</td> <td>Moderate (6)</td> </tr> </tbody> </table>			Description	Without Enhancement	With Enhancement	<i>Probability</i>	Probable (3)	Highly Probable (4)	<i>Duration</i>	Long term (4)	Medium term (3)	<i>Extent</i>	Local (2)	Local (2)	<i>Magnitude</i>	Low (4)	Moderate (6)	<ul style="list-style-type: none"> General and skilled locals must be considered for employment during construction (contractor and construction crew). Local suppliers must be considered for the purchase of construction material. 	Medium						
Description	Without Enhancement	With Enhancement																							
<i>Probability</i>	Probable (3)	Highly Probable (4)																							
<i>Duration</i>	Long term (4)	Medium term (3)																							
<i>Extent</i>	Local (2)	Local (2)																							
<i>Magnitude</i>	Low (4)	Moderate (6)																							

POTENTIAL IMPACTS			PROPOSED MITIGATION	RISK OF THE IMPACT MITIGATION NOT BEING IMPLEMENTED
<i>Significance</i>	30 (Low)	44 (Medium)		
<i>Status (positive or negative)</i>	Positive	Positive		

Method Alternative 2: Construction of HDPE pipes using Horizontal Directional Drilling (HDD) method

Table 8: Construction Impacts

POTENTIAL IMPACTS			PROPOSED MITIGATION	RISK OF THE IMPACT MITIGATION NOT BEING IMPLEMENTED																					
<p>Nature of Impact: <u>Changing the quantity and fluctuation properties of the watercourse by for example diverting or obstructing flow.</u></p> <p>Source: The compaction of soil and the clearing of vegetation in the delineated wetland and buffer zone.</p> <table border="1"> <thead> <tr> <th>Description</th> <th>Without Mitigation</th> <th>With Mitigation</th> </tr> </thead> <tbody> <tr> <td><i>Probability</i></td> <td>Probable (3)</td> <td>Improbable (2)</td> </tr> <tr> <td><i>Duration</i></td> <td>Medium term (3)</td> <td>Short term (2)</td> </tr> <tr> <td><i>Extent</i></td> <td>Regional (3)</td> <td>Local (2)</td> </tr> <tr> <td><i>Magnitude</i></td> <td>Moderate (6)</td> <td>Low (4)</td> </tr> <tr> <td><i>Significance</i></td> <td>36 (Medium)</td> <td>16 (Low)</td> </tr> <tr> <td><i>Status (positive or negative)</i></td> <td>Negative</td> <td>Negative</td> </tr> </tbody> </table>			Description	Without Mitigation	With Mitigation	<i>Probability</i>	Probable (3)	Improbable (2)	<i>Duration</i>	Medium term (3)	Short term (2)	<i>Extent</i>	Regional (3)	Local (2)	<i>Magnitude</i>	Moderate (6)	Low (4)	<i>Significance</i>	36 (Medium)	16 (Low)	<i>Status (positive or negative)</i>	Negative	Negative	<ul style="list-style-type: none"> • A temporary fence or demarcation must be erected around No-Go Areas outside the proposed works area prior to any construction taking place as part of the contractor planning phase when compiling work method statements to prevent access to the adjacent portions of the watercourse. • Effective stormwater management should be a priority during the construction phase. This should be monitored as part of the EMPr. High energy stormwater input into the watercourses should be prevented at all cost. • Sediment control should be effective and not allow any release of sediment pollution downstream. This should be audited on a weekly basis to demonstrate compliance with upstream conditions. 	<p>Impacts to the flow characteristics of this watercourse are likely to be permanent unless mitigated and/ or rehabilitated.</p>
Description	Without Mitigation	With Mitigation																							
<i>Probability</i>	Probable (3)	Improbable (2)																							
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<i>Significance</i>	36 (Medium)	16 (Low)																							
<i>Status (positive or negative)</i>	Negative	Negative																							
<p>Nature of Impact: <u>Changes in sediment entering and exiting the system.</u></p>			<ul style="list-style-type: none"> • Consider the various methods and equipment available and select whichever method(s) will have the least impact on watercourses. 	<p>Expected to be limited provided that the mitigation measures are implemented correctly and effective rehabilitation of the</p>																					

POTENTIAL IMPACTS	PROPOSED MITIGATION	RISK OF THE IMPACT MITIGATION NOT BEING IMPLEMENTED												
<p>Source: Changing the amount of sediment entering the water resource and associated change in turbidity (increasing or decreasing the amount). Construction and operational activities will result in earthworks and soil disturbance as well as the removal of natural vegetation. This could result in the loss of topsoil, sedimentation of the wetland and increase the turbidity of the water.</p> <p>Possible sources of the impacts include:</p> <ul style="list-style-type: none"> • Earthwork activities during construction. • Clearing of surface vegetation will expose the soils, which in rainy events would wash through the watercourse, causing sedimentation. In addition, indigenous vegetation communities are unlikely to colonise eroded soils successfully and seeds from proximate alien invasive trees can spread easily into these eroded soil. • Disturbance of soil surface. • Disturbance of slopes through creation of roads and tracks adjacent to the watercourse. • Erosion (e.g. gully formation, bank collapse). <table border="1" data-bbox="192 1233 813 1390"> <thead> <tr> <th>Description</th> <th>Without Mitigation</th> <th>With Mitigation</th> </tr> </thead> <tbody> <tr> <td>Probability</td> <td>Probable (3)</td> <td>Improbable (2)</td> </tr> <tr> <td>Duration</td> <td>Medium term (3)</td> <td>Short term (2)</td> </tr> <tr> <td>Extent</td> <td>Regional (3)</td> <td>Local (2)</td> </tr> </tbody> </table>	Description	Without Mitigation	With Mitigation	Probability	Probable (3)	Improbable (2)	Duration	Medium term (3)	Short term (2)	Extent	Regional (3)	Local (2)	<ul style="list-style-type: none"> • Water may seep into trenching and earthworks. It is likely that water will be contaminated within these earthworks and should thus be cleaned or dissipated into a structure that allows for additional sediment input and slows down the velocity of the water thus reducing the risk of erosion. Effective sediment traps should be installed. • Construction in and around watercourses must be restricted to the dryer winter months where possible. • Remove only the vegetation where essential for construction and do not allow any disturbance to the adjoining natural vegetation cover. • Protect all areas susceptible to erosion and ensure that there is no undue soil erosion resultant from activities within and adjacent to the construction camp and work areas. • Runoff from the construction area must be managed to avoid erosion and pollution problems. • Implementation of best management practices • Maintain buffer zones to trap sediments • Monitoring should be done to ensure that sediment pollution is timeously dressed. 	<p>site is undertaken where necessary.</p>
Description	Without Mitigation	With Mitigation												
Probability	Probable (3)	Improbable (2)												
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POTENTIAL IMPACTS			PROPOSED MITIGATION	RISK OF THE IMPACT MITIGATION NOT BEING IMPLEMENTED																					
<i>Magnitude</i>	Moderate (6)	Low (4)																							
<i>Significance</i>	36 (Medium)	16 (Low)																							
<i>Status (positive or negative)</i>	Negative	Negative																							
<p>Nature of impact: <u>Introduction and spread of alien vegetation.</u></p> <p>Source: The moving of soil and vegetation resulting in opportunistic invasions after disturbance and the introduction of seed in building materials and on vehicles. Invasions of alien plants can impact on hydrology, by reducing the quantity of water entering a watercourse, and outcompete natural vegetation, decreasing the natural biodiversity. Once in a system alien invasive plants can spread through the catchment. If allowed to seed before control measures are implemented alien plants can easily colonise and impact on downstream users.</p> <table border="1"> <thead> <tr> <th>Description</th> <th>Without Mitigation</th> <th>With Mitigation</th> </tr> </thead> <tbody> <tr> <td><i>Probability</i></td> <td>Highly Probable (4)</td> <td>Probable (3)</td> </tr> <tr> <td><i>Duration</i></td> <td>Medium term (3)</td> <td>Medium term (3)</td> </tr> <tr> <td><i>Extent</i></td> <td>Local (2)</td> <td>Local (2)</td> </tr> <tr> <td><i>Magnitude</i></td> <td>Low (4)</td> <td>Low (4)</td> </tr> <tr> <td><i>Significance</i></td> <td>36 (Medium)</td> <td>27 (Low)</td> </tr> <tr> <td><i>Status (positive or negative)</i></td> <td>Negative</td> <td>Negative</td> </tr> </tbody> </table>			Description	Without Mitigation	With Mitigation	<i>Probability</i>	Highly Probable (4)	Probable (3)	<i>Duration</i>	Medium term (3)	Medium term (3)	<i>Extent</i>	Local (2)	Local (2)	<i>Magnitude</i>	Low (4)	Low (4)	<i>Significance</i>	36 (Medium)	27 (Low)	<i>Status (positive or negative)</i>	Negative	Negative	<ul style="list-style-type: none"> • Implement an Alien Plant Control Plan • Retain vegetation and soil in position for as long as possible, removing it immediately ahead of construction / earthworks in that area and returning it where possible afterwards. • Monitor the establishment of alien invasive species within the areas affected by the construction and maintenance and take immediate corrective action where invasive species are observed to establish. 	<p>Expected to be limited provided that the mitigation measures are implemented correctly and effective rehabilitation of the site is undertaken where necessary.</p>
Description	Without Mitigation	With Mitigation																							
<i>Probability</i>	Highly Probable (4)	Probable (3)																							
<i>Duration</i>	Medium term (3)	Medium term (3)																							
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<i>Magnitude</i>	Low (4)	Low (4)																							
<i>Significance</i>	36 (Medium)	27 (Low)																							
<i>Status (positive or negative)</i>	Negative	Negative																							
<p>Nature of the Impact: <u>Loss and disturbance of watercourse habitat and fringe vegetation.</u></p> <table border="1"> <thead> <tr> <th>Description</th> <th>Without Mitigation</th> <th>With Mitigation</th> </tr> </thead> <tbody> <tr> <td><i>Probability</i></td> <td>Probable (3)</td> <td>Improbable (2)</td> </tr> </tbody> </table>			Description	Without Mitigation	With Mitigation	<i>Probability</i>	Probable (3)	Improbable (2)	<ul style="list-style-type: none"> • Where construction occurs in the demarcated watercourse and buffer, extra precautions should be implemented so as to minimise habitat loss. • Other than approved and authorized structure, no other 	<p>Expected to be limited provided that the mitigation measures are implemented correctly and effective rehabilitation of the site is undertaken where</p>															
Description	Without Mitigation	With Mitigation																							
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POTENTIAL IMPACTS			PROPOSED MITIGATION	RISK OF THE IMPACT MITIGATION NOT BEING IMPLEMENTED																					
<i>Duration</i>	Medium term (3)	Short term (2)	development or maintenance infrastructure is allowed within the delineated watercourse or associated buffer zones. <ul style="list-style-type: none"> • Demarcate the watercourse areas and buffer zones to limit disturbance, clearly mark these areas as no-go areas • Monitor the establishment of alien invasive species within the areas affected by the construction and take immediate corrective action where invasive species are observed to establish. 	necessary.																					
<i>Extent</i>	Local (2)	Local (2)																							
<i>Magnitude</i>	Moderate (6)	Low (4)																							
<i>Significance</i>	33 (Medium)	16 (Low)																							
<i>Status (positive or negative)</i>	Negative	Negative																							
<p>Nature of the Impact: <u>Changes in water quality due to foreign materials and increased nutrients.</u></p> <p>Source: Construction activities may result in the discharge of solvents and other industrial chemicals, leakage of fuel/oil from vehicles and the disposal of sewage resulting in the loss of sensitive biota in the wetlands/rivers and a reduction in watercourse function.</p> <table border="1"> <thead> <tr> <th>Description</th> <th>Without Mitigation</th> <th>With Mitigation</th> </tr> </thead> <tbody> <tr> <td><i>Probability</i></td> <td>Probable (3)</td> <td>Probable (3)</td> </tr> <tr> <td><i>Duration</i></td> <td>Medium term (3)</td> <td>Short term (2)</td> </tr> <tr> <td><i>Extent</i></td> <td>Local (2)</td> <td>Local (2)</td> </tr> <tr> <td><i>Magnitude</i></td> <td>Moderate (6)</td> <td>Low (4)</td> </tr> <tr> <td><i>Significance</i></td> <td>33 (Medium)</td> <td>24 (Low)</td> </tr> <tr> <td><i>Status (positive or negative)</i></td> <td>Negative</td> <td>Negative</td> </tr> </tbody> </table>			Description	Without Mitigation	With Mitigation	<i>Probability</i>	Probable (3)	Probable (3)	<i>Duration</i>	Medium term (3)	Short term (2)	<i>Extent</i>	Local (2)	Local (2)	<i>Magnitude</i>	Moderate (6)	Low (4)	<i>Significance</i>	33 (Medium)	24 (Low)	<i>Status (positive or negative)</i>	Negative	Negative	<ul style="list-style-type: none"> • Provision of adequate sanitation facilities located outside of the watercourse or its associated buffer zone. • Implementation of appropriate stormwater management around the excavation to prevent the ingress of run-off into the excavation and to prevent contaminated runoff into the watercourse. • The development footprint must be fenced off from the watercourses and no related impacts may be allowed into the watercourse e.g. water runoff from cleaning of equipment, vehicle access etc. • After construction, the land must be cleared of rubbish, surplus materials, and equipment, and all parts of the land shall be left in a condition as close as possible to that prior to use. • Maintenance of construction vehicles / equipment should not take place within the watercourse or watercourse buffer. • Maintenance of buffer zones to trap sediments with associated toxins • Treatment of pollution identified should be prioritized accordingly. 	Expected to be limited provided that the mitigation measures are implemented correctly and effective rehabilitation of the site is undertaken where necessary.
Description	Without Mitigation	With Mitigation																							
<i>Probability</i>	Probable (3)	Probable (3)																							
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<i>Significance</i>	33 (Medium)	24 (Low)																							
<i>Status (positive or negative)</i>	Negative	Negative																							
<p>Nature of the Impact: <u>Terrestrial and riverine fauna habitat</u></p>			<ul style="list-style-type: none"> • Conduct activities during the dry season. 	Limited																					

POTENTIAL IMPACTS	PROPOSED MITIGATION	RISK OF THE IMPACT MITIGATION NOT BEING IMPLEMENTED																					
<p><u>destruction and loss of habitat connectivity.</u></p> <p>Only moderately sensitive environments for fauna are considered. The highly sensitive area is cordoned off and upstream and should not be impacted by the proposed activities. In general, activities in moderately sensitive areas are targeted along existing roads and bridges and should not further impact on connectivity. Any activities in moderately sensitive areas must commence in a manner that will reduce the duration of the impact and prevent downstream pollution and sedimentation.</p> <table border="1" data-bbox="190 766 813 1077"> <thead> <tr> <th>Description</th> <th>Without Mitigation</th> <th>With Mitigation</th> </tr> </thead> <tbody> <tr> <td>Probability</td> <td>Probable (3)</td> <td>Improbable (2)</td> </tr> <tr> <td>Duration</td> <td>Temporary (1)</td> <td>Temporary (1)</td> </tr> <tr> <td>Extent</td> <td>Local (2)</td> <td>Local (2)</td> </tr> <tr> <td>Magnitude</td> <td>Moderate (6)</td> <td>Low (4)</td> </tr> <tr> <td>Significance</td> <td>27 (Low)</td> <td>14 (Low)</td> </tr> <tr> <td>Status (positive or negative)</td> <td>Negative</td> <td>Negative</td> </tr> </tbody> </table>	Description	Without Mitigation	With Mitigation	Probability	Probable (3)	Improbable (2)	Duration	Temporary (1)	Temporary (1)	Extent	Local (2)	Local (2)	Magnitude	Moderate (6)	Low (4)	Significance	27 (Low)	14 (Low)	Status (positive or negative)	Negative	Negative	<ul style="list-style-type: none"> • Peg out CBA and ESAs as no-go areas. • Peg out areas for trenches and contractors/ storage camp before commencing with activities to prevent disturbance to areas not targeted for development. 	
Description	Without Mitigation	With Mitigation																					
Probability	Probable (3)	Improbable (2)																					
Duration	Temporary (1)	Temporary (1)																					
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Magnitude	Moderate (6)	Low (4)																					
Significance	27 (Low)	14 (Low)																					
Status (positive or negative)	Negative	Negative																					
<p><u>Nature of the Impact:</u> <u>Destruction of burrowing / fossorial fauna through excavation.</u></p> <p>The developed nature of the overall site means that much of the site has been affected by past developments and the potential for burrowing species to reside in the areas is unlikely and limited to species that have adapted to human settlements</p>	<ul style="list-style-type: none"> • Peg out and demarcate areas for trench excavation and camp before commencing with excavation. • Maintain excavation and camp/storage areas as small as possible to limit the area of disturbance. • Stockpile excavated soil loosely along the trench and utilise as soon as pipeline is installed to reduce surface exposure of any organisms within the stockpiles. 	<p>Limited</p>																					

POTENTIAL IMPACTS			PROPOSED MITIGATION	RISK OF THE IMPACT MITIGATION NOT BEING IMPLEMENTED																					
<p>and disturbed environments.</p> <table border="1"> <thead> <tr> <th>Description</th> <th>Without Mitigation</th> <th>With Mitigation</th> </tr> </thead> <tbody> <tr> <td>Probability</td> <td>Improbable (2)</td> <td>Highly Improbable (1)</td> </tr> <tr> <td>Duration</td> <td>Temporary (1)</td> <td>Temporary (1)</td> </tr> <tr> <td>Extent</td> <td>Site (1)</td> <td>Site (1)</td> </tr> <tr> <td>Magnitude</td> <td>Low (2)</td> <td>Low (2)</td> </tr> <tr> <td>Significance</td> <td>8 (Low)</td> <td>4 (Low)</td> </tr> <tr> <td>Status (positive or negative)</td> <td>Negative</td> <td>Negative</td> </tr> </tbody> </table>			Description	Without Mitigation	With Mitigation	Probability	Improbable (2)	Highly Improbable (1)	Duration	Temporary (1)	Temporary (1)	Extent	Site (1)	Site (1)	Magnitude	Low (2)	Low (2)	Significance	8 (Low)	4 (Low)	Status (positive or negative)	Negative	Negative	<ul style="list-style-type: none"> • Keep surface of stockpiles moist. • Maintain the substrate in surrounding areas in tact to provide source populations which can then repopulate rehabilitated areas. 	
Description	Without Mitigation	With Mitigation																							
Probability	Improbable (2)	Highly Improbable (1)																							
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Magnitude	Low (2)	Low (2)																							
Significance	8 (Low)	4 (Low)																							
Status (positive or negative)	Negative	Negative																							
<p>Nature of the Impact: <u>Destruction of Red-Listed fauna species.</u></p> <p>The nature of most of the site and the type of development means that the probability of TOP species occurring in activity areas at the time of activities is unlikely. Most TOPS are likely to retreat to the surrounding natural areas associated with the Hamberg Dam, which is cordoned off.</p> <table border="1"> <thead> <tr> <th>Description</th> <th>Without Mitigation</th> <th>With Mitigation</th> </tr> </thead> <tbody> <tr> <td>Probability</td> <td>Highly Improbable (1)</td> <td>Highly Improbable (1)</td> </tr> <tr> <td>Duration</td> <td>Permanent (5)</td> <td>Permanent (5)</td> </tr> <tr> <td>Extent</td> <td>Local (2)</td> <td>Site (1)</td> </tr> <tr> <td>Magnitude</td> <td>High (10)</td> <td>High (10)</td> </tr> <tr> <td>Significance</td> <td>17 (Low)</td> <td>16 (Low)</td> </tr> <tr> <td>Status (positive or negative)</td> <td>Negative</td> <td>Negative</td> </tr> </tbody> </table>			Description	Without Mitigation	With Mitigation	Probability	Highly Improbable (1)	Highly Improbable (1)	Duration	Permanent (5)	Permanent (5)	Extent	Local (2)	Site (1)	Magnitude	High (10)	High (10)	Significance	17 (Low)	16 (Low)	Status (positive or negative)	Negative	Negative	<ul style="list-style-type: none"> • Ensure all drivers on site and staff and contractors are informed of the importance of TOP species that may possibly occur on site through environmental awareness training. 	Limited
Description	Without Mitigation	With Mitigation																							
Probability	Highly Improbable (1)	Highly Improbable (1)																							
Duration	Permanent (5)	Permanent (5)																							
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Significance	17 (Low)	16 (Low)																							
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POTENTIAL IMPACTS	PROPOSED MITIGATION	RISK OF THE IMPACT MITIGATION NOT BEING IMPLEMENTED																					
<p>Nature of the Impact: <u>Disturbance to fauna through noise, vibration, dust and emigration of fauna from site, and resulting influx of fauna to neighbouring areas.</u></p> <p>The existing nature of the site means that these impacts are taking place on a daily basis and the additional contribution by the proposed development will be minimal.</p> <table border="1" data-bbox="192 603 813 922"> <thead> <tr> <th>Description</th> <th>Without Mitigation</th> <th>With Mitigation</th> </tr> </thead> <tbody> <tr> <td>Probability</td> <td>Definite (5)</td> <td>Probable (3)</td> </tr> <tr> <td>Duration</td> <td>Temporary (1)</td> <td>Temporary (1)</td> </tr> <tr> <td>Extent</td> <td>Site (1)</td> <td>Site (1)</td> </tr> <tr> <td>Magnitude</td> <td>Low (2)</td> <td>Low (2)</td> </tr> <tr> <td>Significance</td> <td>20 (Low)</td> <td>12 (Low)</td> </tr> <tr> <td>Status (positive or negative)</td> <td>Negative</td> <td>Negative</td> </tr> </tbody> </table>	Description	Without Mitigation	With Mitigation	Probability	Definite (5)	Probable (3)	Duration	Temporary (1)	Temporary (1)	Extent	Site (1)	Site (1)	Magnitude	Low (2)	Low (2)	Significance	20 (Low)	12 (Low)	Status (positive or negative)	Negative	Negative	<ul style="list-style-type: none"> • Utilise quieter equipment where feasible. • Ensure dust suppression, through water sprinkling, is applied at time of high dust generation. • Any noisy point-sources utilised on site should be enclosed, and all equipment/ machinery fitted with silencers where applicable. • All equipment/ machinery will be serviced and maintained within operating specifications to prevent excessive noise. 	<p>Limited</p>
Description	Without Mitigation	With Mitigation																					
Probability	Definite (5)	Probable (3)																					
Duration	Temporary (1)	Temporary (1)																					
Extent	Site (1)	Site (1)																					
Magnitude	Low (2)	Low (2)																					
Significance	20 (Low)	12 (Low)																					
Status (positive or negative)	Negative	Negative																					
<p>Nature of the Impact: <u>Attraction of pests and exotic / alien species.</u></p> <p>The nature of the site means that several urbanised exotic and alien invasive species are already present in the area. Activities, such as leaving food and food waste out, could attract additional species or individuals to site which must at all costs be avoided. AIS out-compete local species and are a severe threat to biodiversity.</p> <table border="1" data-bbox="192 1310 813 1383"> <thead> <tr> <th>Description</th> <th>Without Mitigation</th> <th>With Mitigation</th> </tr> </thead> <tbody> <tr> <td>Probability</td> <td>Probable (3)</td> <td>Highly Improbable (1)</td> </tr> </tbody> </table>	Description	Without Mitigation	With Mitigation	Probability	Probable (3)	Highly Improbable (1)	<ul style="list-style-type: none"> • Compile and implement an alien invasive management plan in line with the municipal management plan, which must include measures to prevent attracting additional alien avifauna such as the common myna and house sparrow to site. This should include not feeding wild life and ensuring that all food and food waste is placed in sealed containers and not exposed on site. • Ensure that the outside areas are kept clean and tidy and provide adequate waste removal services for disposal of waste to prevent the attraction of exotic scavenging species to the site. • Inspect and clear waste from site on a daily basis. Maintaining and improving local indigenous populations creates competition 	<p>Limited</p>															
Description	Without Mitigation	With Mitigation																					
Probability	Probable (3)	Highly Improbable (1)																					

POTENTIAL IMPACTS			PROPOSED MITIGATION	RISK OF THE IMPACT MITIGATION NOT BEING IMPLEMENTED																					
<i>Duration</i>	Medium term (3)	Medium term (3)	for invading species and could assist in reducing alien species numbers on site.																						
<i>Extent</i>	Local (2)	Local (2)																							
<i>Magnitude</i>	Moderate (6)	Moderate (6)																							
<i>Significance</i>	36 (Medium)	12 (Low)																							
<i>Status (positive or negative)</i>	Negative	Negative																							
<p>Nature of the Impact: <u>Hindrance, trapping, killing of fauna.</u></p> <p>Staff and contractors on site must undergo environmental awareness training which must include strict instruction on the prevention of deliberate trapping, killing, hindering of fauna in the area. This is applicable to all groups of fauna, from invertebrates to mammals. No indigenous animals are allowed to be caught under any circumstances, not even to for subsistence purposes.</p> <table border="1"> <thead> <tr> <th>Description</th> <th>Without Mitigation</th> <th>With Mitigation</th> </tr> </thead> <tbody> <tr> <td><i>Probability</i></td> <td>Improbable (2)</td> <td>Highly Improbable (1)</td> </tr> <tr> <td><i>Duration</i></td> <td>Permanent (5)</td> <td>Permanent (5)</td> </tr> <tr> <td><i>Extent</i></td> <td>Site (1)</td> <td>Site (1)</td> </tr> <tr> <td><i>Magnitude</i></td> <td>Low (4)</td> <td>Low (2)</td> </tr> <tr> <td><i>Significance</i></td> <td>20 (Low)</td> <td>8 (Low)</td> </tr> <tr> <td><i>Status (positive or negative)</i></td> <td>Negative</td> <td>Negative</td> </tr> </tbody> </table>			Description	Without Mitigation	With Mitigation	<i>Probability</i>	Improbable (2)	Highly Improbable (1)	<i>Duration</i>	Permanent (5)	Permanent (5)	<i>Extent</i>	Site (1)	Site (1)	<i>Magnitude</i>	Low (4)	Low (2)	<i>Significance</i>	20 (Low)	8 (Low)	<i>Status (positive or negative)</i>	Negative	Negative	<ul style="list-style-type: none"> All contractors on site must undergo environmental awareness training which must include the prohibition of any harm or hindrance to any indigenous fauna species. Ensure safe speed limits on the property. Contracts with contractors must specify actions that will be taken against contractors who do not conduct activities in line with the EMP. Should any indigenous fauna be inadvertently trapped within the development area or trenches, activities will cease and specialists brought in to safely remove the animals from site. 	Limited
Description	Without Mitigation	With Mitigation																							
<i>Probability</i>	Improbable (2)	Highly Improbable (1)																							
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<i>Significance</i>	20 (Low)	8 (Low)																							
<i>Status (positive or negative)</i>	Negative	Negative																							
<p>Nature of the Impact: <u>Pollution of faunal environments and habitats through leaks and spills of hazardous substances (hydrocarbons and chemicals), littering and dumping of waste,</u></p>			<ul style="list-style-type: none"> Discontinue use of all faulty machinery/ equipment on site until properly repaired. Facilities will be provided for storage of all hazardous substances 	Medium																					

POTENTIAL IMPACTS	PROPOSED MITIGATION	RISK OF THE IMPACT MITIGATION NOT BEING IMPLEMENTED																					
<p><u>cement spills, sewage leaks including downstream impacts through run-off.</u></p> <p>All activity sites must be kept neat and tidy and all facilities must operate properly. Any pollution to the environment could leach and contaminate soils and groundwater, and could also contaminate downstream environments through storm-water run-off which will impact wetlands, aquatic ecology and water quality. Therefore ALL substances on site must be stored, handled and disposed of as prescribed by law and national or prescribed standards.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Description</th> <th style="text-align: center;">Without Mitigation</th> <th style="text-align: center;">With Mitigation</th> </tr> </thead> <tbody> <tr> <td>Probability</td> <td style="text-align: center;">Highly Probable (4)</td> <td style="text-align: center;">Improbable (2)</td> </tr> <tr> <td>Duration</td> <td style="text-align: center;">Medium term (3)</td> <td style="text-align: center;">Medium term (3)</td> </tr> <tr> <td>Extent</td> <td style="text-align: center;">Local (2)</td> <td style="text-align: center;">Site (1)</td> </tr> <tr> <td>Magnitude</td> <td style="text-align: center;">Moderate (6)</td> <td style="text-align: center;">Low (2)</td> </tr> <tr> <td>Significance</td> <td style="text-align: center;">44 (Medium)</td> <td style="text-align: center;">12 (Low)</td> </tr> <tr> <td>Status (positive or negative)</td> <td style="text-align: center;">Negative</td> <td style="text-align: center;">Negative</td> </tr> </tbody> </table>	Description	Without Mitigation	With Mitigation	Probability	Highly Probable (4)	Improbable (2)	Duration	Medium term (3)	Medium term (3)	Extent	Local (2)	Site (1)	Magnitude	Moderate (6)	Low (2)	Significance	44 (Medium)	12 (Low)	Status (positive or negative)	Negative	Negative	<p>and waste to prevent the exposure of these substances to the environment.</p> <ul style="list-style-type: none"> • Ensure no sewage leaks occur during pipe replacement by stopping flow or providing for diversions during replacement/ repair work. • Provide for adequate portable toilets for the number of staff on site and provide for male and female staff. • Keep portable toilets clean and hygienic and keep all facilities outside the flood lines and wetlands. • Portable toilets must be properly managed and emptied regularly to prevent overflow and leaks. • Waste (domestic, construction, hazardous) should be recycled as far as possible and sold/given to interested contractors. • Waste will be stored according to the Norms and Standards for Storage of Waste. • Recyclable waste should not be stored for excessive periods. • Refuse bins with properly secured lids will be placed around site to collect waste for separation, recycling and disposal. • All equipment / machinery will be serviced and maintained within operating specifications to prevent the risks of leak. • Repairs to vehicles will be conducted off-site and where this is not possible the underlying ground will be covered with impermeable sheet and pans. • Due to proximity of petrol stations, hydrocarbon storage on site should be limited. • All oily rags and oil-contaminated containers will be placed in the 	
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POTENTIAL IMPACTS	PROPOSED MITIGATION	RISK OF THE IMPACT MITIGATION NOT BEING IMPLEMENTED
	<p>hazardous used-hydrocarbon drums for disposal to a hazardous waste facility.</p> <ul style="list-style-type: none"> • Any machinery or equipment parked on site will either be parked on a concrete slab or have pans placed under them to collect all drips and potential leaks. • Cement bags will be stored under a tarpaulin and on an impervious sheet. • Cement mixing will take place within a designated area outside the flood-line and over tray or sheeting with bunding to prevent spills onto bare ground. • Inspect and clear all litter and waste from the site and surrounds. • All hydrocarbons spills on bare ground will be cleared immediately. • This will include the lifting of contaminated soil for bio-remediation or disposal to a hazardous waste facility. • All dry and wet cement spills on bare ground will be cleared immediately. • Remove all materials and waste from site on departing the area. • Leave no materials behind and ensure all earth material (any excavated earth) has been levelled and rehabilitated. 	
<p>Nature of the Impact: <u>Clearing of vegetation.</u></p> <p>The construction may require the removal of the modified grassland that serves as a catchment and buffer to riparian vegetation. Secondary grassland vegetation along the Bennie Reinecke Park boundary wall will be removed for the pipeline.</p>	<ul style="list-style-type: none"> • Preferably, no construction camps or storage of equipment must be planned within the secondary grassland west of Minnaar Street, upslope from the <i>Phragmites australis</i> wetland area. If unavoidable, the area must be fenced and edge effects prevented. • An independent Ecological Control Officer (ECO) should be 	<p>Limited</p>

POTENTIAL IMPACTS	PROPOSED MITIGATION	RISK OF THE IMPACT MITIGATION NOT BEING IMPLEMENTED																					
<p>Source:</p> <ul style="list-style-type: none"> Clearing of and damage to vegetation in construction footprint, access roads, construction camps, vehicle/ machinery traffic and trampling by workers. Illegal disposal and dumping of construction material such as cement or oil, as well as maintenance materials during construction. <table border="1" data-bbox="192 647 813 967"> <thead> <tr> <th>Description</th> <th>Without Mitigation</th> <th>With Mitigation</th> </tr> </thead> <tbody> <tr> <td>Probability</td> <td>Probable (3)</td> <td>Improbable (2)</td> </tr> <tr> <td>Duration</td> <td>Short term (2)</td> <td>Short term (2)</td> </tr> <tr> <td>Extent</td> <td>Local (2)</td> <td>Site (1)</td> </tr> <tr> <td>Magnitude</td> <td>Moderate (6)</td> <td>Low (4)</td> </tr> <tr> <td>Significance</td> <td>30 (Low)</td> <td>14 (Low)</td> </tr> <tr> <td>Status (positive or negative)</td> <td>Negative</td> <td>Negative</td> </tr> </tbody> </table>	Description	Without Mitigation	With Mitigation	Probability	Probable (3)	Improbable (2)	Duration	Short term (2)	Short term (2)	Extent	Local (2)	Site (1)	Magnitude	Moderate (6)	Low (4)	Significance	30 (Low)	14 (Low)	Status (positive or negative)	Negative	Negative	<p>appointed to oversee construction.</p> <ul style="list-style-type: none"> Prohibit vehicular or pedestrian access into natural areas beyond the demarcated boundary of the construction area or any semi-natural natural areas outside of the construction. Only remove vegetation where absolutely necessary and retain vegetation in place for as long as possible prior to removal. A vegetation rehabilitation plan should already be implemented during construction and include the following: Secondary grassland that needs to be cleared can be removed as sods and stored within disturbed areas. The sods must preferably be removed during the winter months and be replanted by latest springtime. The sods should not be stacked on top of each other. Once construction is completed, these sods should be used to rehabilitate the disturbed areas from where they have been removed. In the absence of timely rainfall, the sods should be watered well after planting and at least twice more over the next 2 weeks. Grasses that naturally occur in the area should be sown/ hydro-seeded in the disturbed footprint. Construction workers may not remove flora and neither may anyone collect seed from the plants without permission from the local authority. No activities should take place during rainy events and at least 2 days afterwards. Where topsoil needs to be removed, store such in a separate area where such soils can be protected until they can be re-used 	
Description	Without Mitigation	With Mitigation																					
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POTENTIAL IMPACTS	PROPOSED MITIGATION	RISK OF THE IMPACT MITIGATION NOT BEING IMPLEMENTED																					
	<p>for post-construction rehabilitation where applicable. Never mix topsoil with subsoils or other spoil materials.</p> <ul style="list-style-type: none"> • Maintain site demarcations in position until the cessation of construction work. • After construction, the land must be cleared of rubbish, surplus materials, and equipment, and all parts of the land must be left in a condition as close as possible to that prior to construction. 																						
<p>Nature of the Impact: <u>Destruction or degradation of vegetation associated with watercourses and moist grassland.</u></p> <p>The construction of the pipeline will inevitably require the removal of moist grassland and riparian vegetation or at least some edge effects onto these. This will impact on the health and functioning of the vegetation within the watercourse. Construction could also result in pollution of the watercourse.</p> <table border="1" data-bbox="190 933 813 1252"> <thead> <tr> <th>Description</th> <th>Without Mitigation</th> <th>With Mitigation</th> </tr> </thead> <tbody> <tr> <td>Probability</td> <td>Definite (5)</td> <td>Probable (3)</td> </tr> <tr> <td>Duration</td> <td>Medium term (3)</td> <td>Short term (2)</td> </tr> <tr> <td>Extent</td> <td>Local (2)</td> <td>Local (2)</td> </tr> <tr> <td>Magnitude</td> <td>High (8)</td> <td>Moderate (6)</td> </tr> <tr> <td>Significance</td> <td style="background-color: red;">65 (High)</td> <td style="background-color: green;">30 (Low)</td> </tr> <tr> <td>Status (positive or negative)</td> <td>Negative</td> <td>Negative</td> </tr> </tbody> </table>	Description	Without Mitigation	With Mitigation	Probability	Definite (5)	Probable (3)	Duration	Medium term (3)	Short term (2)	Extent	Local (2)	Local (2)	Magnitude	High (8)	Moderate (6)	Significance	65 (High)	30 (Low)	Status (positive or negative)	Negative	Negative	<ul style="list-style-type: none"> • No activities may proceed within or in proximity to watercourses without a Water Use License permitting the activity. • Construction mitigation as per above. • The wetland and associated buffer zones as delineated by a wetland specialist should be fenced during the construction phase to prevent any human activity from encroaching into these areas, other than that which is essential to the construction. Monitoring of the fences is important to ensure no infringement of the fences occurs. • Construction within the wetland should preferably take place during the dry winter months. • Input of sediment during construction activities should be prevented at all cost. Mitigation for this potential impact includes establishment of vegetation as soon as possible after construction. • Pollution of the surface and groundwater. Mitigation for this potential impact includes: <ul style="list-style-type: none"> ▪ In the case of pollution of any surface or groundwater, the Regional Representative of the Department of Water 	<p>High risk</p>
Description	Without Mitigation	With Mitigation																					
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POTENTIAL IMPACTS	PROPOSED MITIGATION	RISK OF THE IMPACT MITIGATION NOT BEING IMPLEMENTED
	<p>and Sanitation must be informed immediately.</p> <ul style="list-style-type: none"> ▪ Store all litter carefully so it cannot be washed or blown into the water course. ▪ Construction vehicles are to be maintained in good working order so as to reduce the probability of leakage of fuels and lubricants. ▪ A walled concrete platform, dedicated store with adequate flooring or bermed area should be used to accommodate chemicals such as fuel, oil, paint, herbicide and insecticides, as appropriate, in well-ventilated areas. ▪ Storage of potentially hazardous materials should be above any 100-year flood line or the functional wetland boundary (and its associated buffer zone). These materials include fuel, oil, cement, bitumen etc. ▪ Surface water draining off contaminated areas containing oil and petrol would need to be channelled towards a sump which will separate these chemicals and oils. ▪ Concrete is to be mixed on mixing trays only, not on exposed soil. ▪ Concrete and tar shall be mixed only in areas which have been specially demarcated for this purpose. ▪ After all the concrete/ tar mixing is complete all waste concrete/ tar shall be removed from the batching area and disposed of at an approved dumpsite. ▪ All construction materials liable to spillage are to be 	

POTENTIAL IMPACTS	PROPOSED MITIGATION	RISK OF THE IMPACT MITIGATION NOT BEING IMPLEMENTED																					
	<p>stored in appropriate structures with impermeable flooring; Portable septic toilets are to be provided and maintained for construction crews. Maintenance must include their removal without sewage spillage.</p> <ul style="list-style-type: none"> ▪ Under no circumstances may ablutions occur outside of the provided facilities. ▪ No uncontrolled discharges from the construction crew camps to any surface water resources shall be permitted. Any discharge points need to be approved by the relevant authority. <ul style="list-style-type: none"> • Ensure that the vegetation disturbed during construction is rehabilitated. 																						
<p>Nature of the Impact: <u>Destruction of protected plants and plants of conservation concern.</u></p> <p>Construction will likely impact on the <i>Crinum bulbispermum</i> recorded within the modified / built-up vegetation.</p> <table border="1" data-bbox="192 1015 813 1329"> <thead> <tr> <th>Description</th> <th>Without Mitigation</th> <th>With Mitigation</th> </tr> </thead> <tbody> <tr> <td>Probability</td> <td>Probable (3)</td> <td>Improbable (2)</td> </tr> <tr> <td>Duration</td> <td>Permanent (5)</td> <td>Short term (2)</td> </tr> <tr> <td>Extent</td> <td>Site (1)</td> <td>Site (1)</td> </tr> <tr> <td>Magnitude</td> <td>Moderate (6)</td> <td>Low (4)</td> </tr> <tr> <td>Significance</td> <td style="background-color: yellow;">36 (Medium)</td> <td style="background-color: green;">14 (Low)</td> </tr> <tr> <td>Status (positive or negative)</td> <td>Negative</td> <td>Negative</td> </tr> </tbody> </table>	Description	Without Mitigation	With Mitigation	Probability	Probable (3)	Improbable (2)	Duration	Permanent (5)	Short term (2)	Extent	Site (1)	Site (1)	Magnitude	Moderate (6)	Low (4)	Significance	36 (Medium)	14 (Low)	Status (positive or negative)	Negative	Negative	<ul style="list-style-type: none"> • The Declining plant species should either be avoided by the route or relocated. The species can also be replanted as part of rehabilitation. • The species can only be removed once a permit for the removal or relocation of such species is granted by the GDARD. • Protected plants must be removed by a suitably qualified specialist and replanted in suitable habitat such as the buffer areas of the moist grasslands. Their survival must be monitored for at least two growing seasons after relocation. • Construction workers may not tamper or remove these plants, and neither may anyone collect seed from the plants without permission from the local authority. 	<p>Medium risk</p>
Description	Without Mitigation	With Mitigation																					
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Magnitude	Moderate (6)	Low (4)																					
Significance	36 (Medium)	14 (Low)																					
Status (positive or negative)	Negative	Negative																					
<p>Nature of the Impact: <u>Potential increase in invasive</u></p>	<ul style="list-style-type: none"> • Alien invasive species, in particular category 1b species that 	<p>Medium risk</p>																					

POTENTIAL IMPACTS	PROPOSED MITIGATION	RISK OF THE IMPACT MITIGATION NOT BEING IMPLEMENTED																					
<p><u>vegetation.</u></p> <p>The seed of alien invasive plant species that occur on and in the vicinity of the construction areas could spread into the disturbed and stockpiled soil. Also, the construction vehicles and equipment were likely used on various other sites and could introduce alien invasive plant seeds or indigenous plants not belonging to this vegetation unit to the construction site.</p> <table border="1" data-bbox="190 643 813 959"> <thead> <tr> <th>Description</th> <th>Without Mitigation</th> <th>With Mitigation</th> </tr> </thead> <tbody> <tr> <td>Probability</td> <td>Highly Probable (4)</td> <td>Probable (3)</td> </tr> <tr> <td>Duration</td> <td>Long term (4)</td> <td>Short term (2)</td> </tr> <tr> <td>Extent</td> <td>Local (2)</td> <td>Site (1)</td> </tr> <tr> <td>Magnitude</td> <td>High (8)</td> <td>Low (4)</td> </tr> <tr> <td>Significance</td> <td style="background-color: yellow;">56 (Medium)</td> <td style="background-color: green;">21 (Low)</td> </tr> <tr> <td>Status (positive or negative)</td> <td>Negative</td> <td>Negative</td> </tr> </tbody> </table>	Description	Without Mitigation	With Mitigation	Probability	Highly Probable (4)	Probable (3)	Duration	Long term (4)	Short term (2)	Extent	Local (2)	Site (1)	Magnitude	High (8)	Low (4)	Significance	56 (Medium)	21 (Low)	Status (positive or negative)	Negative	Negative	<p>were identified on site must be removed from the development footprint and immediate surrounds, prior to construction or soil disturbances. By removing these species, the spread of seeds will be prevented into disturbed soils which could thus have a positive impact on the surrounding natural vegetation.</p> <ul style="list-style-type: none"> • All alien seedlings and saplings must be removed as they become evident for the duration of construction. • All construction vehicles and equipment, as well as construction material should be free of plant material. Therefore, all equipment and vehicles should be thoroughly cleaned prior to access on to the construction areas. This should be verified by the ECO. • If filling material is to be used, this should be sourced from areas free of invasive species. 	
Description	Without Mitigation	With Mitigation																					
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Status (positive or negative)	Negative	Negative																					
<p>Nature of the Impact: <u>Clearing of land for construction camps and potential pollution of the soil and water.</u></p> <p>These may be at one or several locations, area will be cleared and levelled where necessary, site offices may be temporary structures, machinery, building supplies and temporary staff facilities (excluding accommodation) will be housed here. The impacts could include:</p> <ul style="list-style-type: none"> • Removal of vegetation. • Levelling and compaction of soils. 	<ul style="list-style-type: none"> • Construction camps must not be located in proximity to the <i>Phragmites australis</i> wetland. • Prevent spillage of construction material and other pollutants, contain and treat any spillages immediately, strictly prohibit any pollution/littering. Ensure there is a method statement in place to remedy any accidental spillages immediately. • No open fires may be lit for cooking or any other purposes, unless in specifically designated and secured areas. • No vehicles may be washed on site, except in suitably designed and protected areas. 	<p>Medium risk</p>																					

POTENTIAL IMPACTS	PROPOSED MITIGATION	RISK OF THE IMPACT MITIGATION NOT BEING IMPLEMENTED																					
<ul style="list-style-type: none"> Storage of machinery, supplies and staff facilities. <p>This could lead to the loss of vegetation and/or species of conservation concern, alteration and loss of microhabitats, altered vegetation cover, increased erosion and contamination of soil and groundwater.</p> <table border="1" data-bbox="190 564 813 879"> <thead> <tr> <th>Description</th> <th>Without Mitigation</th> <th>With Mitigation</th> </tr> </thead> <tbody> <tr> <td>Probability</td> <td>Probable (3)</td> <td>Improbable (2)</td> </tr> <tr> <td>Duration</td> <td>Medium term (3)</td> <td>Short term (2)</td> </tr> <tr> <td>Extent</td> <td>Local (2)</td> <td>Site (1)</td> </tr> <tr> <td>Magnitude</td> <td>Moderate (6)</td> <td>Low (4)</td> </tr> <tr> <td>Significance</td> <td>33 (Medium)</td> <td>14 (Low)</td> </tr> <tr> <td>Status (positive or negative)</td> <td>Negative</td> <td>Negative</td> </tr> </tbody> </table>	Description	Without Mitigation	With Mitigation	Probability	Probable (3)	Improbable (2)	Duration	Medium term (3)	Short term (2)	Extent	Local (2)	Site (1)	Magnitude	Moderate (6)	Low (4)	Significance	33 (Medium)	14 (Low)	Status (positive or negative)	Negative	Negative	<ul style="list-style-type: none"> No vehicles may be serviced or repaired on the property, unless it is an emergency situation in which case adequate spillage containment must be implemented. 	
Description	Without Mitigation	With Mitigation																					
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Status (positive or negative)	Negative	Negative																					
<p>Nature of the Impact: <u>Exposure to erosion and subsequent sedimentation or pollution of proximate watercourses.</u></p> <p>The removal of surface vegetation will expose the soils, which in rainy events would wash down into the watercourses, causing sedimentation. In addition, indigenous vegetation communities are unlikely to colonise eroded soils successfully and seeds from proximate alien invasive plant species can spread easily into these eroded soils. After construction, a lack of rehabilitation or failed rehabilitation will result in bare soils that are susceptible to erosion. The sources of this impact include:</p> <ul style="list-style-type: none"> Removal of vegetation in proximity to the moist 	<ul style="list-style-type: none"> Do not allow erosion to develop on a large scale before taking action. Where possible, no construction / activities should be undertaken within the riparian or moist grassland areas. The extent of wetland conditions should be verified by a wetland specialist and no activities should take place within these areas without that a Water Use License was granted by the Department of Water Affairs (DWA) for these activities. Retain vegetation and soil in position for as long as possible, removing it immediately ahead of construction / earthworks in that area (DWAF, 2005). Runoff from road must be managed to avoid erosion and 	<p>Medium risk</p>																					

POTENTIAL IMPACTS	PROPOSED MITIGATION	RISK OF THE IMPACT MITIGATION NOT BEING IMPLEMENTED																					
<p>grassland or riparian area, without proper rehabilitation or failure of rehabilitation.</p> <ul style="list-style-type: none"> • Access roads, especially on slopes, channels rainfall and causes erosion. • Lack of rehabilitation or failed rehabilitation. • Maintenance vehicles disturbing rehabilitated areas. • Spillages of construction material and harmful chemicals. • Failure of rehabilitation of the construction footprint. <table border="1" data-bbox="192 683 813 1002"> <thead> <tr> <th>Description</th> <th>Without Mitigation</th> <th>With Mitigation</th> </tr> </thead> <tbody> <tr> <td>Probability</td> <td>Highly Probable (4)</td> <td>Probable (3)</td> </tr> <tr> <td>Duration</td> <td>Medium term (3)</td> <td>Short term (2)</td> </tr> <tr> <td>Extent</td> <td>Local (2)</td> <td>Site (1)</td> </tr> <tr> <td>Magnitude</td> <td>High (8)</td> <td>Low (4)</td> </tr> <tr> <td>Significance</td> <td style="background-color: yellow;">52 (Medium)</td> <td style="background-color: green;">21 (Low)</td> </tr> <tr> <td>Status (positive or negative)</td> <td>Negative</td> <td>Negative</td> </tr> </tbody> </table>	Description	Without Mitigation	With Mitigation	Probability	Highly Probable (4)	Probable (3)	Duration	Medium term (3)	Short term (2)	Extent	Local (2)	Site (1)	Magnitude	High (8)	Low (4)	Significance	52 (Medium)	21 (Low)	Status (positive or negative)	Negative	Negative	<p>pollution problems.</p> <ul style="list-style-type: none"> • Ensure that runoff from compacted or sealed surfaces is slowed down and dispersed sufficiently to prevent accelerated erosion from being initiated (erosion management plan required) • Colonisation of the disturbed areas by plants species from the surrounding natural vegetation must be monitored to ensure that indigenous vegetation cover is sufficient within one growing season. Due to the high degree of invasive species in the area, it is active rehabilitation e.g. hydroseeding is recommended, along with an alien invasive management plan. • Protect all areas susceptible to erosion and ensure that there is no undue soil erosion resultant from activities within and adjacent to the construction camp and work areas. • After construction clear any temporarily impacted areas of all foreign materials, re-apply and/or loosen topsoils and landscape to surrounding level. 	
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Significance	52 (Medium)	21 (Low)																					
Status (positive or negative)	Negative	Negative																					
<p>Nature of the Impact: <u>Loss and disturbance of heritage sites due to the development.</u></p> <table border="1" data-bbox="192 1129 813 1375"> <thead> <tr> <th>Description</th> <th>Without Mitigation</th> <th>With Mitigation</th> </tr> </thead> <tbody> <tr> <td>Probability</td> <td>Very improbable (1)</td> <td>Very improbable (1)</td> </tr> <tr> <td>Duration</td> <td>Permanent (4)</td> <td>Permanent (4)</td> </tr> <tr> <td>Extent</td> <td>Site (1)</td> <td>Site (1)</td> </tr> <tr> <td>Magnitude</td> <td>Minor (2)</td> <td>Minor (2)</td> </tr> <tr> <td>Significance</td> <td style="background-color: green;">7 (Low)</td> <td style="background-color: green;">7 (Low)</td> </tr> </tbody> </table>	Description	Without Mitigation	With Mitigation	Probability	Very improbable (1)	Very improbable (1)	Duration	Permanent (4)	Permanent (4)	Extent	Site (1)	Site (1)	Magnitude	Minor (2)	Minor (2)	Significance	7 (Low)	7 (Low)	<ul style="list-style-type: none"> • Should graves, fossils or any archaeological artefacts be identified during construction, work on the area where the artefacts were found, must cease immediately and it should immediately be reported to a heritage practitioner or local museum so that an investigation and evaluation of the finds can be made. 	<p>Low risk anticipated provided that the mitigation measures are implemented correctly.</p>			
Description	Without Mitigation	With Mitigation																					
Probability	Very improbable (1)	Very improbable (1)																					
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POTENTIAL IMPACTS			PROPOSED MITIGATION	RISK OF THE IMPACT MITIGATION NOT BEING IMPLEMENTED
<i>Status (positive or negative)</i>	Negative	Negative		
<p>As no sites, features or objects of cultural significance are known to exist in the development area, there would be no impact as a result of the proposed development.</p>				
<p>Nature of Impact: <u>Visual</u></p> <p>Surface disturbances and the presence of a construction team are uncharacteristic events in the study area and may cause unsightly views as a result of the activity.</p> <p>Introduction of construction equipment, ground staff, construction vehicles and equipment that is unfamiliar in the baseline environment.</p> <p>Source of Impact:</p> <ul style="list-style-type: none"> • Construction vehicles. • Construction material. • Barricading and fencing. • Rubble on site. • Construction crew. 			<ul style="list-style-type: none"> • Construction vehicles should only park in designated areas. • Waste to be kept only at specific sites on site and to be removed weekly. • Do not locate the construction camp or laydown yards within 1km from any residential area or tourist attraction, unless it can be completely screened from sensitive viewpoints. Preferably, construction camps should be in a dedicated construction camp in the industrial area, in an area that is already disturbed. • Avoid the construction of additional access roads by keeping to existing roads where possible. • Avoid removal of any large trees or shrubs that may open views to the construction site and compromise the natural screening capacity of the study area. • Clearly demarcate the construction site to limit the area of disturbance. • Keep dust levels down by regularly wetting dirt roads and exposed soil areas. • Remove rubble and other waste that is generated by the construction process as soon as possible and dispose at an appropriate dump site. 	<p>The site will not be visually appealing during the construction phase.</p>
Description	Without Mitigation	With Mitigation		
<i>Probability</i>	Definite (5)	Highly Probable (4)		
<i>Duration</i>	Medium term (3)	Medium term (3)		
<i>Extent</i>	Site (1)	Site (1)		
<i>Magnitude</i>	Moderate (6)	Low (4)		

POTENTIAL IMPACTS			PROPOSED MITIGATION	RISK OF THE IMPACT MITIGATION NOT BEING IMPLEMENTED																					
<i>Significance</i>	50 (Medium)	32 (Medium)	<ul style="list-style-type: none"> Keep the construction camp neat and tidy at all times. Remove any waste from the site or contain it in an enclosed area out of sight from sensitive viewpoints. Enhance screening of the construction camps by erecting a temporary fence with a 3m high shade cloth to limit the intrusive nature of such a site. 																						
<i>Status (positive or negative)</i>	Negative	Negative																							
<p>Nature of Impact: <u>Dust Generation</u></p> <p>Construction machinery and heavy vehicles which are likely to make use of the existing gravel roads to transport equipment and material to the construction site, are likely to generate dust which is likely to be perceptible by adjacent residents. Trucks may potentially distribute dust along internal access roads as well as into the watercourse given the nature of the activities.</p> <p>Source of Impact:</p> <ul style="list-style-type: none"> Clearing of vegetation. Construction vehicles. <table border="1"> <thead> <tr> <th>Description</th> <th>Without Mitigation</th> <th>With Mitigation</th> </tr> </thead> <tbody> <tr> <td><i>Probability</i></td> <td>Definite (5)</td> <td>Probable (3)</td> </tr> <tr> <td><i>Duration</i></td> <td>Short term (2)</td> <td>Short term (2)</td> </tr> <tr> <td><i>Extent</i></td> <td>Local (2)</td> <td>Local (2)</td> </tr> <tr> <td><i>Magnitude</i></td> <td>High (8)</td> <td>Moderate (6)</td> </tr> <tr> <td><i>Significance</i></td> <td>60 (Medium)</td> <td>30 (Low)</td> </tr> <tr> <td><i>Status (positive or negative)</i></td> <td>Negative</td> <td>Negative</td> </tr> </tbody> </table>			Description	Without Mitigation	With Mitigation	<i>Probability</i>	Definite (5)	Probable (3)	<i>Duration</i>	Short term (2)	Short term (2)	<i>Extent</i>	Local (2)	Local (2)	<i>Magnitude</i>	High (8)	Moderate (6)	<i>Significance</i>	60 (Medium)	30 (Low)	<i>Status (positive or negative)</i>	Negative	Negative	<ul style="list-style-type: none"> Vegetation clearance should be kept to a minimum (only where necessary). Wet all unprotected cleared areas and stockpiles with water to suppress dust pollution during dry and windy periods. Warning barricading should be placed around open trenches and should be suitable for high winds. Speed limits should be enforced to ensure that the generation of dust by construction vehicles are limited. Dust suppression at least twice a day; morning and before the end of the working day. A continuous dust monitoring process needs to be undertaken during construction. All vehicles transporting friable materials such a sand, rubble etc must be covered by a tarpaulin or wet down. Construction work to be undertaken during weekdays as far as practical. 	Medium risk (as the amount of dust emitted into the air will be of high volumes); unless mitigation measures are implemented.
Description	Without Mitigation	With Mitigation																							
<i>Probability</i>	Definite (5)	Probable (3)																							
<i>Duration</i>	Short term (2)	Short term (2)																							
<i>Extent</i>	Local (2)	Local (2)																							
<i>Magnitude</i>	High (8)	Moderate (6)																							
<i>Significance</i>	60 (Medium)	30 (Low)																							
<i>Status (positive or negative)</i>	Negative	Negative																							

POTENTIAL IMPACTS	PROPOSED MITIGATION	RISK OF THE IMPACT MITIGATION NOT BEING IMPLEMENTED																					
<p>Nature of Impact: <u>Crime, safety and security</u></p> <p>Source of Impact:</p> <ul style="list-style-type: none"> • Lack of security. • Easy access. • Construction area not enclosed. • Poorly trained personnel using equipment and vehicles. <table border="1" data-bbox="192 630 813 946"> <thead> <tr> <th>Description</th> <th>Without Mitigation</th> <th>With Mitigation</th> </tr> </thead> <tbody> <tr> <td>Probability</td> <td>Highly Probable (4)</td> <td>Probable (3)</td> </tr> <tr> <td>Duration</td> <td>Medium term (3)</td> <td>Medium term (3)</td> </tr> <tr> <td>Extent</td> <td>Local (2)</td> <td>Local (2)</td> </tr> <tr> <td>Magnitude</td> <td>Moderate (6)</td> <td>Low (4)</td> </tr> <tr> <td>Significance</td> <td>44 (Medium)</td> <td>27 (Low)</td> </tr> <tr> <td>Status (positive or negative)</td> <td>Negative</td> <td>Negative</td> </tr> </tbody> </table>	Description	Without Mitigation	With Mitigation	Probability	Highly Probable (4)	Probable (3)	Duration	Medium term (3)	Medium term (3)	Extent	Local (2)	Local (2)	Magnitude	Moderate (6)	Low (4)	Significance	44 (Medium)	27 (Low)	Status (positive or negative)	Negative	Negative	<ul style="list-style-type: none"> • Ensure that the construction vehicles as well as equipment are under the control of competent personnel and are in proper working order. • Ensure that the contact details of the police or security company and ambulance services are available on site. • Limit access to the construction camp to construction workers through access control. • Comply with the requirements of the Occupational Health and Safety Act, 1993 (Act No.85 of 1993) requirements. • Ensure that the handling of equipment and materials is supervised and adequately instructed. • Vehicular traffic during construction activities must be limited to a maximum speed limit of 30 km/hr. • The security fence around the development site must be completed before construction commences internally. 	<p>If not mitigated, medium risk to personnel as well as the construction site if safety measures are not put in place before construction commences.</p>
Description	Without Mitigation	With Mitigation																					
Probability	Highly Probable (4)	Probable (3)																					
Duration	Medium term (3)	Medium term (3)																					
Extent	Local (2)	Local (2)																					
Magnitude	Moderate (6)	Low (4)																					
Significance	44 (Medium)	27 (Low)																					
Status (positive or negative)	Negative	Negative																					
<p>Nature of Impact: <u>Noise</u></p> <p>Source of Impact:</p> <ul style="list-style-type: none"> • Construction vehicles. • Equipment and machinery. <table border="1" data-bbox="192 1169 813 1374"> <thead> <tr> <th>Description</th> <th>Without Mitigation</th> <th>With Mitigation</th> </tr> </thead> <tbody> <tr> <td>Probability</td> <td>Definite (5)</td> <td>Definite (5)</td> </tr> <tr> <td>Duration</td> <td>Medium term (3)</td> <td>Medium term (3)</td> </tr> <tr> <td>Extent</td> <td>Local (2)</td> <td>Local (2)</td> </tr> <tr> <td>Magnitude</td> <td>Moderate (6)</td> <td>Low (4)</td> </tr> </tbody> </table>	Description	Without Mitigation	With Mitigation	Probability	Definite (5)	Definite (5)	Duration	Medium term (3)	Medium term (3)	Extent	Local (2)	Local (2)	Magnitude	Moderate (6)	Low (4)	<ul style="list-style-type: none"> • Construction and the use of construction machinery should be limited between 06h00 and 18h00 on weekdays only. • Institute noise control measures throughout the construction phase for all applicable activities, including the construction times. • Ensure that noise licensers are installed on the construction vehicles and machineries to reduce the noise level. • Inform residents of nearby residential areas of planned noisy activities outside the timeframes stated above. • No construction should occur during weekends, unless the 	<p>High risk as construction vehicles and equipment causes noise pollution.</p>						
Description	Without Mitigation	With Mitigation																					
Probability	Definite (5)	Definite (5)																					
Duration	Medium term (3)	Medium term (3)																					
Extent	Local (2)	Local (2)																					
Magnitude	Moderate (6)	Low (4)																					

POTENTIAL IMPACTS			PROPOSED MITIGATION	RISK OF THE IMPACT MITIGATION NOT BEING IMPLEMENTED																					
<i>Significance</i>	55 (Medium)	45 (Medium)	adjacent residents have been notified in writing at least three days in advance. <ul style="list-style-type: none"> Construction activities must abide by the national noise laws and the municipal noise by-laws with regard to the abatement of noise caused by mechanical equipment. 																						
<i>Status (positive or negative)</i>	Negative	Negative																							
Nature of impact: <u>Traffic and accessibility</u> <table border="1"> <thead> <tr> <th>Description</th> <th>Without Mitigation</th> <th>With Mitigation</th> </tr> </thead> <tbody> <tr> <td><i>Probability</i></td> <td>Definite (5)</td> <td>Highly Probable (4)</td> </tr> <tr> <td><i>Duration</i></td> <td>Short term (2)</td> <td>Short term (2)</td> </tr> <tr> <td><i>Extent</i></td> <td>Local (2)</td> <td>Local (2)</td> </tr> <tr> <td><i>Magnitude</i></td> <td>Moderate (6)</td> <td>Low (4)</td> </tr> <tr> <td><i>Significance</i></td> <td>50 (Medium)</td> <td>32 (Medium)</td> </tr> <tr> <td><i>Status (positive or negative)</i></td> <td>Negative</td> <td>Negative</td> </tr> </tbody> </table>			Description	Without Mitigation	With Mitigation	<i>Probability</i>	Definite (5)	Highly Probable (4)	<i>Duration</i>	Short term (2)	Short term (2)	<i>Extent</i>	Local (2)	Local (2)	<i>Magnitude</i>	Moderate (6)	Low (4)	<i>Significance</i>	50 (Medium)	32 (Medium)	<i>Status (positive or negative)</i>	Negative	Negative	<ul style="list-style-type: none"> Traffic accommodation for construction activities affecting the travelled way as well as the sidewalks of the travelled way. If one lane is expected to be closed, "Stop and Go" will be used for traffic accommodation. In the case of complete road closure, traffic diversion must be accommodated for. 	High risk
Description	Without Mitigation	With Mitigation																							
<i>Probability</i>	Definite (5)	Highly Probable (4)																							
<i>Duration</i>	Short term (2)	Short term (2)																							
<i>Extent</i>	Local (2)	Local (2)																							
<i>Magnitude</i>	Moderate (6)	Low (4)																							
<i>Significance</i>	50 (Medium)	32 (Medium)																							
<i>Status (positive or negative)</i>	Negative	Negative																							
Nature of impact: <u>Socioeconomic</u> Source of Impact: <ul style="list-style-type: none"> Job creation for local skilled labour, general labour and suppliers. <table border="1"> <thead> <tr> <th>Description</th> <th>Without Enhancement</th> <th>With Enhancement</th> </tr> </thead> <tbody> <tr> <td><i>Probability</i></td> <td>Probable (3)</td> <td>Highly Probable (4)</td> </tr> <tr> <td><i>Duration</i></td> <td>Short term (2)</td> <td>Short term (2)</td> </tr> <tr> <td><i>Extent</i></td> <td>Local (2)</td> <td>Local (2)</td> </tr> <tr> <td><i>Magnitude</i></td> <td>Low (4)</td> <td>Moderate (6)</td> </tr> </tbody> </table>			Description	Without Enhancement	With Enhancement	<i>Probability</i>	Probable (3)	Highly Probable (4)	<i>Duration</i>	Short term (2)	Short term (2)	<i>Extent</i>	Local (2)	Local (2)	<i>Magnitude</i>	Low (4)	Moderate (6)	<ul style="list-style-type: none"> General and skilled locals must be considered for employment during construction (contractor and construction crew). Local suppliers must be considered for the purchase of construction material. 	Medium						
Description	Without Enhancement	With Enhancement																							
<i>Probability</i>	Probable (3)	Highly Probable (4)																							
<i>Duration</i>	Short term (2)	Short term (2)																							
<i>Extent</i>	Local (2)	Local (2)																							
<i>Magnitude</i>	Low (4)	Moderate (6)																							

POTENTIAL IMPACTS			PROPOSED MITIGATION	RISK OF THE IMPACT MITIGATION NOT BEING IMPLEMENTED
<i>Significance</i>	24 (Low)	40 (Medium)		
<i>Status (positive or negative)</i>	Positive	Positive		

Briefly describe and compare the potential impacts (as appropriate), significance rating of impacts, proposed mitigation and significance rating of impacts after mitigation that are likely to occur as a result of the **operational phase** for the various alternatives of the proposed development. This must include an assessment of the significance of all impacts.

Method Alternative 1: Construction of uPVC pipe using open trenching method (Preferred)

Table 9: Operational Impacts

POTENTIAL IMPACTS			PROPOSED MITIGATION	RISK OF THE IMPACT MITIGATION NOT BEING IMPLEMENTED																					
<p>Nature of Impact: <u>Changing the quantity and fluctuation properties of the watercourse by for example diverting or obstructing flow.</u></p> <table border="1"> <thead> <tr> <th>Description</th> <th>Without Mitigation</th> <th>With Mitigation</th> </tr> </thead> <tbody> <tr> <td><i>Probability</i></td> <td>Improbable (2)</td> <td>Improbable (2)</td> </tr> <tr> <td><i>Duration</i></td> <td>Medium term (3)</td> <td>Short term (2)</td> </tr> <tr> <td><i>Extent</i></td> <td>Local (2)</td> <td>Local (2)</td> </tr> <tr> <td><i>Magnitude</i></td> <td>Low (4)</td> <td>Low (4)</td> </tr> <tr> <td><i>Significance</i></td> <td>18 (Low)</td> <td>16 (Low)</td> </tr> <tr> <td><i>Status (positive or negative)</i></td> <td>Negative</td> <td>Negative</td> </tr> </tbody> </table>			Description	Without Mitigation	With Mitigation	<i>Probability</i>	Improbable (2)	Improbable (2)	<i>Duration</i>	Medium term (3)	Short term (2)	<i>Extent</i>	Local (2)	Local (2)	<i>Magnitude</i>	Low (4)	Low (4)	<i>Significance</i>	18 (Low)	16 (Low)	<i>Status (positive or negative)</i>	Negative	Negative	<ul style="list-style-type: none"> Effective stormwater management should be a priority during both construction and operational phase. This should be monitored as part of the EMPr. High energy stormwater input into the watercourses should be prevented at all cost. Changes to natural flow of water (surface water as well as water flowing within the soil profile) on the site above the river area resulting from the proposed stormwater upgrade should be taken into account. 	<p>Impacts to the flow characteristics of this watercourse are likely to be permanent unless rehabilitated.</p>
Description	Without Mitigation	With Mitigation																							
<i>Probability</i>	Improbable (2)	Improbable (2)																							
<i>Duration</i>	Medium term (3)	Short term (2)																							
<i>Extent</i>	Local (2)	Local (2)																							
<i>Magnitude</i>	Low (4)	Low (4)																							
<i>Significance</i>	18 (Low)	16 (Low)																							
<i>Status (positive or negative)</i>	Negative	Negative																							
<p>Nature of Impact: <u>Changing in sediment entering and exiting the system.</u></p> <p>Maintenance activities will result in earthworks and soil disturbance as well as the disturbance of natural vegetation.</p> <table border="1"> <thead> <tr> <th>Description</th> <th>Without Mitigation</th> <th>With Mitigation</th> </tr> </thead> <tbody> <tr> <td><i>Probability</i></td> <td>Probable (3)</td> <td>Improbable (2)</td> </tr> </tbody> </table>			Description	Without Mitigation	With Mitigation	<i>Probability</i>	Probable (3)	Improbable (2)	<ul style="list-style-type: none"> Monitoring should be done to ensure that sediment pollution is timeously dressed. 	<p>Expected to be limited provided that the mitigation measures are implemented correctly and effective rehabilitation of the site is undertaken where necessary.</p>															
Description	Without Mitigation	With Mitigation																							
<i>Probability</i>	Probable (3)	Improbable (2)																							

POTENTIAL IMPACTS			PROPOSED MITIGATION	RISK OF THE IMPACT MITIGATION NOT BEING IMPLEMENTED
<i>Duration</i>	Medium term (3)	Medium term (3)		
<i>Extent</i>	Regional (3)	Local (2)		
<i>Magnitude</i>	Low (4)	Low (4)		
<i>Significance</i>	30 (Low)	18 (Low)		
<i>Status (positive or negative)</i>	Negative	Negative		
Nature of impact: <u>Introduction and spread of alien vegetation.</u>			<ul style="list-style-type: none"> • Weed control in buffer zone. • Monitor the establishment of alien invasive species within the areas affected by the construction and maintenance and take immediate corrective action where invasive species are observed to establish. • Rehabilitate or revegetate disturbed areas. 	Expected to be limited provided that the mitigation measures are implemented correctly and effective rehabilitation of the site is undertaken where necessary.
Description	Without Mitigation	With Mitigation		
<i>Probability</i>	Highly Probable (4)	Probable (3)		
<i>Duration</i>	Medium term (3)	Medium term (3)		
<i>Extent</i>	Local (2)	Local (2)		
<i>Magnitude</i>	Low (4)	Low (4)		
<i>Significance</i>	36 (Medium)	27 (Low)		
<i>Status (positive or negative)</i>	Negative	Negative		
Nature of the Impact: <u>Loss and disturbance of watercourse habitat and fringe vegetation.</u>			<ul style="list-style-type: none"> • Weed control in buffer zone. • Monitor rehabilitation and the occurrence of erosion twice during the rainy season for at least two years and take immediate corrective action where needed. • Monitor the establishment of alien invasive species within the areas affected by the construction and take immediate corrective action where invasive species are observed to establish. • Operational activities should not take place within watercourses or buffer zones, nor should edge effects impact on these areas. • Operational activities should not impact on rehabilitated or naturally vegetated areas. 	Expected to be limited provided that the mitigation measures are implemented correctly and effective rehabilitation of the site is undertaken where necessary.
Description	Without Mitigation	With Mitigation		
<i>Probability</i>	Probable (3)	Improbable (2)		
<i>Duration</i>	Short term (2)	Short term (2)		
<i>Extent</i>	Local (2)	Local (2)		
<i>Magnitude</i>	Moderate (6)	Low (4)		
<i>Significance</i>	30 (Low)	16 (Low)		
<i>Status (positive or negative)</i>	Negative	Negative		

POTENTIAL IMPACTS	PROPOSED MITIGATION	RISK OF THE IMPACT MITIGATION NOT BEING IMPLEMENTED																					
<p>Nature of impact: <u>Changes in water quality due to foreign materials and increased nutrients.</u></p> <p>Operational activities may result in the discharge of solvents and other industrial chemicals, leakage of fuel/oil from vehicles and the disposal of sewage resulting in the loss of sensitive biota in the wetlands/ivers and a reduction in watercourse function.</p> <table border="1" data-bbox="192 683 813 981"> <thead> <tr> <th>Description</th> <th>Without Mitigation</th> <th>With Mitigation</th> </tr> </thead> <tbody> <tr> <td>Probability</td> <td>Highly Probable (4)</td> <td>Probable (3)</td> </tr> <tr> <td>Duration</td> <td>Medium term (3)</td> <td>Short term (2)</td> </tr> <tr> <td>Extent</td> <td>Regional (3)</td> <td>Regional (3)</td> </tr> <tr> <td>Magnitude</td> <td>High (8)</td> <td>Moderate (6)</td> </tr> <tr> <td>Significance</td> <td>56 (Medium)</td> <td>33 (Medium)</td> </tr> <tr> <td>Status (positive or negative)</td> <td>Negative</td> <td>Negative</td> </tr> </tbody> </table>	Description	Without Mitigation	With Mitigation	Probability	Highly Probable (4)	Probable (3)	Duration	Medium term (3)	Short term (2)	Extent	Regional (3)	Regional (3)	Magnitude	High (8)	Moderate (6)	Significance	56 (Medium)	33 (Medium)	Status (positive or negative)	Negative	Negative	<ul style="list-style-type: none"> • Ensure that no operational activities impact on the watercourse or buffer area. This includes edge effects. • Ensure that no operational activities impact on the watercourse or buffer area. This includes edge effects. • Regular independent water quality monitoring should form part of operational procedures in order to identify pollution • Treatment of pollution identified should be prioritized accordingly. • Regular clearing of debris. 	<p>Medium risk</p>
Description	Without Mitigation	With Mitigation																					
Probability	Highly Probable (4)	Probable (3)																					
Duration	Medium term (3)	Short term (2)																					
Extent	Regional (3)	Regional (3)																					
Magnitude	High (8)	Moderate (6)																					
Significance	56 (Medium)	33 (Medium)																					
Status (positive or negative)	Negative	Negative																					
<p>Nature of the Impact: <u>Terrestrial and riverine fauna habitat destruction and loss of habitat connectivity.</u></p> <table border="1" data-bbox="192 1102 813 1375"> <thead> <tr> <th>Description</th> <th>Without Mitigation</th> <th>With Mitigation</th> </tr> </thead> <tbody> <tr> <td>Probability</td> <td>Improbable (2)</td> <td>Improbable (2)</td> </tr> <tr> <td>Duration</td> <td>Temporary (1)</td> <td>Temporary (1)</td> </tr> <tr> <td>Extent</td> <td>Local (2)</td> <td>Site (1)</td> </tr> <tr> <td>Magnitude</td> <td>Low (4)</td> <td>Low (4)</td> </tr> <tr> <td>Significance</td> <td>14 (Low)</td> <td>12 (Low)</td> </tr> <tr> <td>Status (positive or negative)</td> <td>Negative</td> <td>Negative</td> </tr> </tbody> </table>	Description	Without Mitigation	With Mitigation	Probability	Improbable (2)	Improbable (2)	Duration	Temporary (1)	Temporary (1)	Extent	Local (2)	Site (1)	Magnitude	Low (4)	Low (4)	Significance	14 (Low)	12 (Low)	Status (positive or negative)	Negative	Negative	<ul style="list-style-type: none"> • Conduct maintenance activities during the dry season. 	<p>Low risk</p>
Description	Without Mitigation	With Mitigation																					
Probability	Improbable (2)	Improbable (2)																					
Duration	Temporary (1)	Temporary (1)																					
Extent	Local (2)	Site (1)																					
Magnitude	Low (4)	Low (4)																					
Significance	14 (Low)	12 (Low)																					
Status (positive or negative)	Negative	Negative																					

POTENTIAL IMPACTS				PROPOSED MITIGATION	RISK OF THE IMPACT MITIGATION NOT BEING IMPLEMENTED																			
<i>negative)</i>																								
Nature of the Impact: <u>Destruction of burrowing / fossorial fauna through excavation.</u>				<ul style="list-style-type: none"> Maintain excavation and camp/storage areas during maintenance as small as possible to limit the area of disturbance. 	Low risk																			
<table border="1"> <thead> <tr> <th>Description</th> <th>Without Mitigation</th> <th>With Mitigation</th> </tr> </thead> <tbody> <tr> <td>Probability</td> <td>Improbable (2)</td> <td>Highly Improbable (1)</td> </tr> <tr> <td>Duration</td> <td>Temporary (1)</td> <td>Temporary (1)</td> </tr> <tr> <td>Extent</td> <td>Site (1)</td> <td>Site (1)</td> </tr> <tr> <td>Magnitude</td> <td>Low (2)</td> <td>Low (2)</td> </tr> <tr> <td>Significance</td> <td>8 (Low)</td> <td>4 (Low)</td> </tr> <tr> <td>Status (positive or negative)</td> <td>Negative</td> <td>Negative</td> </tr> </tbody> </table>						Description	Without Mitigation	With Mitigation	Probability	Improbable (2)	Highly Improbable (1)	Duration	Temporary (1)	Temporary (1)	Extent	Site (1)	Site (1)	Magnitude	Low (2)	Low (2)	Significance	8 (Low)	4 (Low)	Status (positive or negative)
Description	Without Mitigation	With Mitigation																						
Probability	Improbable (2)	Highly Improbable (1)																						
Duration	Temporary (1)	Temporary (1)																						
Extent	Site (1)	Site (1)																						
Magnitude	Low (2)	Low (2)																						
Significance	8 (Low)	4 (Low)																						
Status (positive or negative)	Negative	Negative																						
Nature of the Impact: <u>Destruction of Red-Listed fauna species.</u>				<ul style="list-style-type: none"> During maintenance, ensure all drivers on site and staff and contractors are informed of the importance of TOP species that may possibly occur on site through environmental awareness training. 	Low risk																			
<table border="1"> <thead> <tr> <th>Description</th> <th>Without Mitigation</th> <th>With Mitigation</th> </tr> </thead> <tbody> <tr> <td>Probability</td> <td>Improbable (2)</td> <td>Highly Improbable (1)</td> </tr> <tr> <td>Duration</td> <td>Temporary (1)</td> <td>Temporary (1)</td> </tr> <tr> <td>Extent</td> <td>Local (2)</td> <td>Site (1)</td> </tr> <tr> <td>Magnitude</td> <td>High (10)</td> <td>High (10)</td> </tr> <tr> <td>Significance</td> <td>26 (Low)</td> <td>12 (Low)</td> </tr> <tr> <td>Status (positive or negative)</td> <td>Negative</td> <td>Negative</td> </tr> </tbody> </table>						Description	Without Mitigation	With Mitigation	Probability	Improbable (2)	Highly Improbable (1)	Duration	Temporary (1)	Temporary (1)	Extent	Local (2)	Site (1)	Magnitude	High (10)	High (10)	Significance	26 (Low)	12 (Low)	Status (positive or negative)
Description	Without Mitigation	With Mitigation																						
Probability	Improbable (2)	Highly Improbable (1)																						
Duration	Temporary (1)	Temporary (1)																						
Extent	Local (2)	Site (1)																						
Magnitude	High (10)	High (10)																						
Significance	26 (Low)	12 (Low)																						
Status (positive or negative)	Negative	Negative																						
Nature of the Impact: <u>Pollution of faunal environments and habitats through leaks and spills of hazardous substances (hydrocarbons and chemicals), littering and dumping of waste, cement spills, sewage leaks including downstream impacts</u>				<ul style="list-style-type: none"> Discontinue use of all faulty machinery/ equipment on site during maintenance. Ensure no sewage leaks occur during maintenance by stopping flow or providing for diversions. 	Medium risk																			

POTENTIAL IMPACTS	PROPOSED MITIGATION	RISK OF THE IMPACT MITIGATION NOT BEING IMPLEMENTED																					
<p><u>through run-off during maintenance.</u></p> <table border="1" data-bbox="192 368 813 684"> <thead> <tr> <th>Description</th> <th>Without Mitigation</th> <th>With Mitigation</th> </tr> </thead> <tbody> <tr> <td>Probability</td> <td>Probable (3)</td> <td>Probable (3)</td> </tr> <tr> <td>Duration</td> <td>Temporary (1)</td> <td>Temporary (1)</td> </tr> <tr> <td>Extent</td> <td>Local (2)</td> <td>Site (1)</td> </tr> <tr> <td>Magnitude</td> <td>High (8)</td> <td>Low (4)</td> </tr> <tr> <td>Significance</td> <td>33 (Medium)</td> <td>18 (Low)</td> </tr> <tr> <td>Status (positive or negative)</td> <td>Negative</td> <td>Negative</td> </tr> </tbody> </table>	Description	Without Mitigation	With Mitigation	Probability	Probable (3)	Probable (3)	Duration	Temporary (1)	Temporary (1)	Extent	Local (2)	Site (1)	Magnitude	High (8)	Low (4)	Significance	33 (Medium)	18 (Low)	Status (positive or negative)	Negative	Negative	<ul style="list-style-type: none"> All equipment / machinery will be serviced and maintained within operating specifications to prevent the risks of leak. Repairs to vehicles will be conducted off-site and where this is not possible the underlying ground will be covered with impermeable sheet and pans. Any machinery or equipment parked on site will either be parked on a concrete slab or have pans placed under them to collect all drips and potential leaks. Remove all materials and waste on completion of maintenance. Leave no materials behind and ensure all earth material (any excavated earth) has been levelled and rehabilitated. 	
Description	Without Mitigation	With Mitigation																					
Probability	Probable (3)	Probable (3)																					
Duration	Temporary (1)	Temporary (1)																					
Extent	Local (2)	Site (1)																					
Magnitude	High (8)	Low (4)																					
Significance	33 (Medium)	18 (Low)																					
Status (positive or negative)	Negative	Negative																					
<p>Nature of the Impact: <u>Clearing of vegetation.</u></p> <table border="1" data-bbox="192 826 813 1142"> <thead> <tr> <th>Description</th> <th>Without Mitigation</th> <th>With Mitigation</th> </tr> </thead> <tbody> <tr> <td>Probability</td> <td>Probable (3)</td> <td>Improbable (2)</td> </tr> <tr> <td>Duration</td> <td>Short term (2)</td> <td>Temporary (1)</td> </tr> <tr> <td>Extent</td> <td>Local (2)</td> <td>Site (1)</td> </tr> <tr> <td>Magnitude</td> <td>Moderate (6)</td> <td>Low (4)</td> </tr> <tr> <td>Significance</td> <td>30 (Low)</td> <td>12 (Low)</td> </tr> <tr> <td>Status (positive or negative)</td> <td>Negative</td> <td>Negative</td> </tr> </tbody> </table>	Description	Without Mitigation	With Mitigation	Probability	Probable (3)	Improbable (2)	Duration	Short term (2)	Temporary (1)	Extent	Local (2)	Site (1)	Magnitude	Moderate (6)	Low (4)	Significance	30 (Low)	12 (Low)	Status (positive or negative)	Negative	Negative	<ul style="list-style-type: none"> Rehabilitate construction camps and any other vegetation that was impacted on by the construction. Use grass sods that were removed prior to construction to rehabilitate the construction footprints. Sods must not be stored for lengthy periods and should not be stacked on top of each other. The sods should preferably be removed during the winter months and replanted by springtime latest. Cordon off areas that are under rehabilitation as no-go areas using danger tape and steel droppers. If necessary, these areas should be fenced off to prevent vehicular or pedestrian access. Ensure that maintenance work does not take place haphazardly, but according to a fixed plan. Maintenance workers may not trample natural vegetation and work should be restricted to previously disturbed footprint. In addition, mitigation measures as set out for the construction 	<p>Medium risk</p>
Description	Without Mitigation	With Mitigation																					
Probability	Probable (3)	Improbable (2)																					
Duration	Short term (2)	Temporary (1)																					
Extent	Local (2)	Site (1)																					
Magnitude	Moderate (6)	Low (4)																					
Significance	30 (Low)	12 (Low)																					
Status (positive or negative)	Negative	Negative																					

POTENTIAL IMPACTS	PROPOSED MITIGATION	RISK OF THE IMPACT MITIGATION NOT BEING IMPLEMENTED																					
	phase should be adhered to. <ul style="list-style-type: none"> Address erosion donga crossings, applying soil erosion control and bank stabilisation procedures as specified by the ECO. 																						
<p>Nature of the Impact: <u>Destruction or degradation of vegetation associated with watercourses and moist grassland.</u></p> <table border="1" data-bbox="192 534 813 852"> <thead> <tr> <th>Description</th> <th>Without Mitigation</th> <th>With Mitigation</th> </tr> </thead> <tbody> <tr> <td>Probability</td> <td>Probable (3)</td> <td>Improbable (2)</td> </tr> <tr> <td>Duration</td> <td>Short term (2)</td> <td>Temporary (1)</td> </tr> <tr> <td>Extent</td> <td>Local (2)</td> <td>Site (1)</td> </tr> <tr> <td>Magnitude</td> <td>Moderate (6)</td> <td>Moderate (6)</td> </tr> <tr> <td>Significance</td> <td>30 (Low)</td> <td>16 (Low)</td> </tr> <tr> <td>Status (positive or negative)</td> <td>Negative</td> <td>Negative</td> </tr> </tbody> </table>	Description	Without Mitigation	With Mitigation	Probability	Probable (3)	Improbable (2)	Duration	Short term (2)	Temporary (1)	Extent	Local (2)	Site (1)	Magnitude	Moderate (6)	Moderate (6)	Significance	30 (Low)	16 (Low)	Status (positive or negative)	Negative	Negative	<ul style="list-style-type: none"> After construction, the land must be cleared of rubbish, surplus materials, and equipment, and all parts of the land must be left in a condition as close as possible to that prior to construction. Ensure that maintenance work does not take place haphazardly, but according to a fixed plan and only within the dedicated road reserves. Cordon off areas that are under rehabilitation as no-go areas using danger tape and steel droppers. If necessary, these areas should be fenced off to prevent vehicular and pedestrian access until such time that rehabilitation was successful. Maintenance workers may not trample natural vegetation and work should be restricted to previously disturbed footprint. In addition, mitigation measures as set out for the construction phase should be adhered to. Address erosion donga crossings, applying soil erosion control and bank stabilisation procedures as specified by the ECO. Repair all erosion damage as soon as possible and in any case not later than six months before the termination of the Maintenance Period to allow for sufficient rehabilitation growth. Stormwater drains must be maintained and regularly checked for any blockage. Monitor rehabilitation for at least three years after construction is complete. If monitoring observed failed rehabilitation or erosion, 	<p>Low risk</p>
Description	Without Mitigation	With Mitigation																					
Probability	Probable (3)	Improbable (2)																					
Duration	Short term (2)	Temporary (1)																					
Extent	Local (2)	Site (1)																					
Magnitude	Moderate (6)	Moderate (6)																					
Significance	30 (Low)	16 (Low)																					
Status (positive or negative)	Negative	Negative																					

POTENTIAL IMPACTS	PROPOSED MITIGATION	RISK OF THE IMPACT MITIGATION NOT BEING IMPLEMENTED																					
	corrective action should be taken immediately to determine the cause and correct the problem.																						
<p>Nature of the Impact: <u>Destruction of protected plants and plants of conservation concern.</u></p> <table border="1" data-bbox="192 499 813 817"> <thead> <tr> <th>Description</th> <th>Without Mitigation</th> <th>With Mitigation</th> </tr> </thead> <tbody> <tr> <td><i>Probability</i></td> <td>Probable (3)</td> <td>Improbable (2)</td> </tr> <tr> <td><i>Duration</i></td> <td>Long term (4)</td> <td>Temporary (1)</td> </tr> <tr> <td><i>Extent</i></td> <td>Local (2)</td> <td>Site (1)</td> </tr> <tr> <td><i>Magnitude</i></td> <td>Low (4)</td> <td>Low (2)</td> </tr> <tr> <td><i>Significance</i></td> <td>30 (Low)</td> <td>12 (Low)</td> </tr> <tr> <td><i>Status (positive or negative)</i></td> <td>Negative</td> <td>Negative</td> </tr> </tbody> </table>	Description	Without Mitigation	With Mitigation	<i>Probability</i>	Probable (3)	Improbable (2)	<i>Duration</i>	Long term (4)	Temporary (1)	<i>Extent</i>	Local (2)	Site (1)	<i>Magnitude</i>	Low (4)	Low (2)	<i>Significance</i>	30 (Low)	12 (Low)	<i>Status (positive or negative)</i>	Negative	Negative	<ul style="list-style-type: none"> • Only use indigenous species within the development gardens. • The relocated species should be monitored for at least two years post relocation. If die back is noted, a specialist should be consulted and corrective action taken as soon as possible. • No operational activities are allowed to impact on the relocated species. 	Medium risk
Description	Without Mitigation	With Mitigation																					
<i>Probability</i>	Probable (3)	Improbable (2)																					
<i>Duration</i>	Long term (4)	Temporary (1)																					
<i>Extent</i>	Local (2)	Site (1)																					
<i>Magnitude</i>	Low (4)	Low (2)																					
<i>Significance</i>	30 (Low)	12 (Low)																					
<i>Status (positive or negative)</i>	Negative	Negative																					
<p>Nature of the Impact: <u>Potential increase in invasive vegetation.</u></p> <table border="1" data-bbox="192 933 813 1254"> <thead> <tr> <th>Description</th> <th>Without Mitigation</th> <th>With Mitigation</th> </tr> </thead> <tbody> <tr> <td><i>Probability</i></td> <td>Probable (3)</td> <td>Improbable (2)</td> </tr> <tr> <td><i>Duration</i></td> <td>Long term (4)</td> <td>Short term (2)</td> </tr> <tr> <td><i>Extent</i></td> <td>Local (2)</td> <td>Site (1)</td> </tr> <tr> <td><i>Magnitude</i></td> <td>Low (4)</td> <td>Low (2)</td> </tr> <tr> <td><i>Significance</i></td> <td>30 (Low)</td> <td>10 (Low)</td> </tr> <tr> <td><i>Status (positive or negative)</i></td> <td>Negative</td> <td>Negative</td> </tr> </tbody> </table>	Description	Without Mitigation	With Mitigation	<i>Probability</i>	Probable (3)	Improbable (2)	<i>Duration</i>	Long term (4)	Short term (2)	<i>Extent</i>	Local (2)	Site (1)	<i>Magnitude</i>	Low (4)	Low (2)	<i>Significance</i>	30 (Low)	10 (Low)	<i>Status (positive or negative)</i>	Negative	Negative	<ul style="list-style-type: none"> • Only use indigenous species within the development gardens. • Monitor and control the grassland and remove alien invasive species as soon as they become apparent. 	Low risk
Description	Without Mitigation	With Mitigation																					
<i>Probability</i>	Probable (3)	Improbable (2)																					
<i>Duration</i>	Long term (4)	Short term (2)																					
<i>Extent</i>	Local (2)	Site (1)																					
<i>Magnitude</i>	Low (4)	Low (2)																					
<i>Significance</i>	30 (Low)	10 (Low)																					
<i>Status (positive or negative)</i>	Negative	Negative																					
<p>Nature of the Impact: <u>Clearing of land for construction camps and potential pollution of the soil and water.</u></p>	<ul style="list-style-type: none"> • Monitor all sites disturbed by construction activities for colonisation by exotics or invasive plants and control these as they emerge. Monitoring should continue for at least two years 	Low risk																					

POTENTIAL IMPACTS			PROPOSED MITIGATION	RISK OF THE IMPACT MITIGATION NOT BEING IMPLEMENTED
Description	Without Mitigation	With Mitigation	after construction is complete.	
Probability	Probable (3)	Improbable (2)		
Duration	Short term (2)	Temporary (1)		
Extent	Local (2)	Site (1)		
Magnitude	Moderate (6)	Low (4)		
Significance	30 (Low)	12 (Low)		
Status (positive or negative)	Negative	Negative		
Nature of the Impact: <u>Exposure to erosion and subsequent sedimentation or pollution of proximate watercourses.</u>			<ul style="list-style-type: none"> • Cordon off areas that are under rehabilitation as no-go areas using danger tape and steel droppers. If necessary, these areas should be fenced off to prevent vehicular and pedestrian access where needed. • Monitor rehabilitation and ensure that rehabilitated areas do not erode. • If monitoring finds that indigenous vegetation from the surrounding grasslands are not colonising the site, implement a re-vegetation plan to ensure that grass species that naturally occur in the Soweto Highveld Grassland, are sowed in order to re-establish indigenous plant cover. 	Medium risk
Description	Without Mitigation	With Mitigation		
Probability	Probable (3)	Improbable (2)		
Duration	Medium term (3)	Short term (2)		
Extent	Local (2)	Site (1)		
Magnitude	Moderate (6)	Low (4)		
Significance	33 (Medium)	14 (Low)		
Status (positive or negative)	Negative	Negative		
Nature of the Impact: <u>Loss and disturbance of heritage sites due to the development</u>			<ul style="list-style-type: none"> • Should graves, fossils or any archaeological artefacts be identified during construction, work on the area where the artefacts were found, must cease immediately and it should immediately be reported to a heritage practitioner or local museum so that an investigation and evaluation of the finds can be made. 	Low risk anticipated provided that the mitigation measures are implemented correctly.
Description	Without Mitigation	With Mitigation		
Probability	Very improbable (1)	Very improbable (1)		
Extent	Site (1)	Site (1)		

POTENTIAL IMPACTS			PROPOSED MITIGATION	RISK OF THE IMPACT MITIGATION NOT BEING IMPLEMENTED
<i>Magnitude</i>	Minor (2)	Minor (2)		
<i>Significance</i>	7 (Low)	7 (Low)		
<i>Status (positive or negative)</i>	Negative	Negative		
<p>As no sites, features or objects of cultural significance are known to exist in the development area, there would be no impact as a result of the proposed development.</p>				
<p>Nature of Impact: <u>Dust Generation</u></p> <p>Construction machinery and heavy vehicles during maintenance which will likely make use of the existing gravel roads to transport equipment and material to the site are likely to generate dust which is likely to be perceptible by adjacent residents and the watercourse. Trucks may potentially distribute dust along internal access roads as well as into the watercourse given the nature of maintenance activities.</p> <p>Source of Impact:</p> <ul style="list-style-type: none"> • Construction vehicles. • Machinery used for maintenance. 			<ul style="list-style-type: none"> • Dust suppression and wet spraying should be implemented during maintenance works. • Limit maintenance hours to daytime and weekdays. • Speed limits should be enforced to ensure that the generation of dust by construction vehicles during maintenance are limited. 	Low risk
Description	Without Mitigation	With Mitigation		
<i>Probability</i>	Probable (3)	Improbable (2)		
<i>Duration</i>	Temporary (1)	Temporary (1)		
<i>Extent</i>	Local (2)	Local (2)		
<i>Magnitude</i>	Moderate (6)	Low (4)		

POTENTIAL IMPACTS			PROPOSED MITIGATION	RISK OF THE IMPACT MITIGATION NOT BEING IMPLEMENTED																					
<i>Significance</i>	27 (Low)	14 (Low)																							
<i>Status (positive or negative)</i>	Negative	Negative																							
<p>Nature of Impact: <u>Noise</u></p> <p>Source of Impact:</p> <ul style="list-style-type: none"> Construction vehicles during maintenance. Equipment and machinery during maintenance. <table border="1"> <thead> <tr> <th>Description</th> <th>Without Mitigation</th> <th>With Mitigation</th> </tr> </thead> <tbody> <tr> <td><i>Probability</i></td> <td>Definite (5)</td> <td>Definite (4)</td> </tr> <tr> <td><i>Duration</i></td> <td>Short term (2)</td> <td>Temporary (1)</td> </tr> <tr> <td><i>Extent</i></td> <td>Local (2)</td> <td>Local (2)</td> </tr> <tr> <td><i>Magnitude</i></td> <td>Moderate (6)</td> <td>Low (4)</td> </tr> <tr> <td><i>Significance</i></td> <td>50 (Medium)</td> <td>28 (Medium)</td> </tr> <tr> <td><i>Status (positive or negative)</i></td> <td>Negative</td> <td>Negative</td> </tr> </tbody> </table>			Description	Without Mitigation	With Mitigation	<i>Probability</i>	Definite (5)	Definite (4)	<i>Duration</i>	Short term (2)	Temporary (1)	<i>Extent</i>	Local (2)	Local (2)	<i>Magnitude</i>	Moderate (6)	Low (4)	<i>Significance</i>	50 (Medium)	28 (Medium)	<i>Status (positive or negative)</i>	Negative	Negative	<ul style="list-style-type: none"> Inform residents of planned maintenance works. Maintenance and the use of construction machinery should be limited between 06h00 and 18h00 on weekdays only. Institute noise control measures throughout maintenance periods. Maintenance activities must abide by the national noise laws and the municipal noise by-laws with regard to the abatement of noise caused by mechanical equipment. Speed limits must be adhered to. 	High risk unless mitigation measures are implemented correctly and effectively.
Description	Without Mitigation	With Mitigation																							
<i>Probability</i>	Definite (5)	Definite (4)																							
<i>Duration</i>	Short term (2)	Temporary (1)																							
<i>Extent</i>	Local (2)	Local (2)																							
<i>Magnitude</i>	Moderate (6)	Low (4)																							
<i>Significance</i>	50 (Medium)	28 (Medium)																							
<i>Status (positive or negative)</i>	Negative	Negative																							
<p>Nature of Impact: <u>Visual</u></p> <table border="1"> <thead> <tr> <th>Description</th> <th>Without Enhancement</th> <th>With Enhancement</th> </tr> </thead> <tbody> <tr> <td><i>Probability</i></td> <td>Highly probable (4)</td> <td>Definite (5)</td> </tr> <tr> <td><i>Duration</i></td> <td>Long term (4)</td> <td>Long term (4)</td> </tr> <tr> <td><i>Extent</i></td> <td>Local (2)</td> <td>Local (2)</td> </tr> <tr> <td><i>Magnitude</i></td> <td>Moderate (6)</td> <td>High (8)</td> </tr> <tr> <td><i>Significance</i></td> <td>48 (Medium)</td> <td>70 (High)</td> </tr> <tr> <td><i>Status (positive or negative)</i></td> <td>Positive</td> <td>Positive</td> </tr> </tbody> </table>			Description	Without Enhancement	With Enhancement	<i>Probability</i>	Highly probable (4)	Definite (5)	<i>Duration</i>	Long term (4)	Long term (4)	<i>Extent</i>	Local (2)	Local (2)	<i>Magnitude</i>	Moderate (6)	High (8)	<i>Significance</i>	48 (Medium)	70 (High)	<i>Status (positive or negative)</i>	Positive	Positive	<ul style="list-style-type: none"> Regular maintenance. 	Medium
Description	Without Enhancement	With Enhancement																							
<i>Probability</i>	Highly probable (4)	Definite (5)																							
<i>Duration</i>	Long term (4)	Long term (4)																							
<i>Extent</i>	Local (2)	Local (2)																							
<i>Magnitude</i>	Moderate (6)	High (8)																							
<i>Significance</i>	48 (Medium)	70 (High)																							
<i>Status (positive or negative)</i>	Positive	Positive																							

POTENTIAL IMPACTS			PROPOSED MITIGATION	RISK OF THE IMPACT MITIGATION NOT BEING IMPLEMENTED																					
<p>Nature of Impact: <u>Safety</u></p> <p>No sewage leakages as a result of burst pipes.</p> <table border="1"> <thead> <tr> <th>Description</th> <th>Without Enhancement</th> <th>With Enhancement</th> </tr> </thead> <tbody> <tr> <td>Probability</td> <td>Probable (3)</td> <td>Highly Probable (4)</td> </tr> <tr> <td>Duration</td> <td>Long term (4)</td> <td>Long term (4)</td> </tr> <tr> <td>Extent</td> <td>Local (2)</td> <td>Local (2)</td> </tr> <tr> <td>Magnitude</td> <td>Moderate (6)</td> <td>High (8)</td> </tr> <tr> <td>Significance</td> <td>36 (Medium)</td> <td>56 (Medium)</td> </tr> <tr> <td>Status (positive or negative)</td> <td>Positive</td> <td>Positive</td> </tr> </tbody> </table>			Description	Without Enhancement	With Enhancement	Probability	Probable (3)	Highly Probable (4)	Duration	Long term (4)	Long term (4)	Extent	Local (2)	Local (2)	Magnitude	Moderate (6)	High (8)	Significance	36 (Medium)	56 (Medium)	Status (positive or negative)	Positive	Positive	<ul style="list-style-type: none"> Regular maintenance. 	Medium
Description	Without Enhancement	With Enhancement																							
Probability	Probable (3)	Highly Probable (4)																							
Duration	Long term (4)	Long term (4)																							
Extent	Local (2)	Local (2)																							
Magnitude	Moderate (6)	High (8)																							
Significance	36 (Medium)	56 (Medium)																							
Status (positive or negative)	Positive	Positive																							
<p>Nature of impact: <u>Socioeconomic</u></p> <p>Source of Impact:</p> <ul style="list-style-type: none"> Overall upliftment of the area. <table border="1"> <thead> <tr> <th>Description</th> <th>Without Enhancement</th> <th>With Enhancement</th> </tr> </thead> <tbody> <tr> <td>Probability</td> <td>Probable (3)</td> <td>Highly Probable (4)</td> </tr> <tr> <td>Duration</td> <td>Long term (4)</td> <td>Long term (4)</td> </tr> <tr> <td>Extent</td> <td>Local (2)</td> <td>Local (2)</td> </tr> <tr> <td>Magnitude</td> <td>Moderate (6)</td> <td>Moderate (6)</td> </tr> <tr> <td>Significance</td> <td>36 (Medium)</td> <td>48 (Medium)</td> </tr> <tr> <td>Status (positive or negative)</td> <td>Positive</td> <td>Positive</td> </tr> </tbody> </table>			Description	Without Enhancement	With Enhancement	Probability	Probable (3)	Highly Probable (4)	Duration	Long term (4)	Long term (4)	Extent	Local (2)	Local (2)	Magnitude	Moderate (6)	Moderate (6)	Significance	36 (Medium)	48 (Medium)	Status (positive or negative)	Positive	Positive	<ul style="list-style-type: none"> Regular maintenance 	Medium
Description	Without Enhancement	With Enhancement																							
Probability	Probable (3)	Highly Probable (4)																							
Duration	Long term (4)	Long term (4)																							
Extent	Local (2)	Local (2)																							
Magnitude	Moderate (6)	Moderate (6)																							
Significance	36 (Medium)	48 (Medium)																							
Status (positive or negative)	Positive	Positive																							

Method Alternative 2: Construction of HDPE pipes using Horizontal Directional Drilling (HDD) method

Table 10: Operational Impacts

POTENTIAL IMPACTS	PROPOSED MITIGATION	RISK OF THE IMPACT MITIGATION NOT BEING IMPLEMENTED																					
<p>Nature of Impact: <u>Changing the quantity and fluctuation properties of the watercourse by for example diverting or obstructing flow.</u></p> <table border="1"> <thead> <tr> <th>Description</th> <th>Without Mitigation</th> <th>With Mitigation</th> </tr> </thead> <tbody> <tr> <td>Probability</td> <td>Improbable (2)</td> <td>Improbable (2)</td> </tr> <tr> <td>Duration</td> <td>Medium term (3)</td> <td>Short term (2)</td> </tr> <tr> <td>Extent</td> <td>Local (2)</td> <td>Local (2)</td> </tr> <tr> <td>Magnitude</td> <td>Low (4)</td> <td>Low (4)</td> </tr> <tr> <td>Significance</td> <td style="background-color: #00ff00;">18 (Low)</td> <td style="background-color: #00ff00;">16 (Low)</td> </tr> <tr> <td>Status (positive or negative)</td> <td>Negative</td> <td>Negative</td> </tr> </tbody> </table>	Description	Without Mitigation	With Mitigation	Probability	Improbable (2)	Improbable (2)	Duration	Medium term (3)	Short term (2)	Extent	Local (2)	Local (2)	Magnitude	Low (4)	Low (4)	Significance	18 (Low)	16 (Low)	Status (positive or negative)	Negative	Negative	<ul style="list-style-type: none"> Effective stormwater management should be a priority during both construction and operational phase. This should be monitored as part of the EMP. High energy stormwater input into the watercourses should be prevented at all cost. Changes to natural flow of water (surface water as well as water flowing within the soil profile) on the site above the river area resulting from the proposed stormwater upgrade should be taken into account. 	<p>Impacts to the flow characteristics of this watercourse are likely to be permanent unless rehabilitated.</p>
Description	Without Mitigation	With Mitigation																					
Probability	Improbable (2)	Improbable (2)																					
Duration	Medium term (3)	Short term (2)																					
Extent	Local (2)	Local (2)																					
Magnitude	Low (4)	Low (4)																					
Significance	18 (Low)	16 (Low)																					
Status (positive or negative)	Negative	Negative																					
<p>Nature of Impact: <u>Changing in sediment entering and exiting the system.</u></p> <p>Maintenance activities will result in earthworks and soil disturbance as well as the disturbance of natural vegetation.</p> <table border="1"> <thead> <tr> <th>Description</th> <th>Without Mitigation</th> <th>With Mitigation</th> </tr> </thead> <tbody> <tr> <td>Probability</td> <td>Probable (3)</td> <td>Improbable (2)</td> </tr> <tr> <td>Duration</td> <td>Medium term (3)</td> <td>Medium term (3)</td> </tr> <tr> <td>Extent</td> <td>Regional (3)</td> <td>Local (2)</td> </tr> <tr> <td>Magnitude</td> <td>Low (4)</td> <td>Low (4)</td> </tr> <tr> <td>Significance</td> <td style="background-color: #00ff00;">30 (Low)</td> <td style="background-color: #00ff00;">18 (Low)</td> </tr> </tbody> </table>	Description	Without Mitigation	With Mitigation	Probability	Probable (3)	Improbable (2)	Duration	Medium term (3)	Medium term (3)	Extent	Regional (3)	Local (2)	Magnitude	Low (4)	Low (4)	Significance	30 (Low)	18 (Low)	<ul style="list-style-type: none"> Monitoring should be done to ensure that sediment pollution is timeously dressed. 	<p>Expected to be limited provided that the mitigation measures are implemented correctly and effective rehabilitation of the site is undertaken where necessary.</p>			
Description	Without Mitigation	With Mitigation																					
Probability	Probable (3)	Improbable (2)																					
Duration	Medium term (3)	Medium term (3)																					
Extent	Regional (3)	Local (2)																					
Magnitude	Low (4)	Low (4)																					
Significance	30 (Low)	18 (Low)																					

POTENTIAL IMPACTS			PROPOSED MITIGATION	RISK OF THE IMPACT MITIGATION NOT BEING IMPLEMENTED
<i>Status (positive or negative)</i>	Negative	Negative		
Nature of impact: <u>Introduction and spread of alien vegetation.</u>			<ul style="list-style-type: none"> • Weed control in buffer zone. • Monitor the establishment of alien invasive species within the areas affected by the construction and maintenance and take immediate corrective action where invasive species are observed to establish. • Rehabilitate or revegetate disturbed areas. 	Expected to be limited provided that the mitigation measures are implemented correctly and effective rehabilitation of the site is undertaken where necessary.
Description	Without Mitigation	With Mitigation		
Probability	Highly Probable (4)	Probable (3)		
Duration	Medium term (3)	Medium term (3)		
Extent	Local (2)	Local (2)		
Magnitude	Low (4)	Low (4)		
Significance	36 (Medium)	27 (Low)		
<i>Status (positive or negative)</i>	Negative	Negative		
Nature of the Impact: <u>Loss and disturbance of watercourse habitat and fringe vegetation.</u>			<ul style="list-style-type: none"> • Weed control in buffer zone. • Monitor rehabilitation and the occurrence of erosion twice during the rainy season for at least two years and take immediate corrective action where needed. • Monitor the establishment of alien invasive species within the areas affected by the construction and take immediate corrective action where invasive species are observed to establish. • Operational activities should not take place within watercourses or buffer zones, nor should edge effects impact on these areas. • Operational activities should not impact on rehabilitated or naturally vegetated areas. 	Expected to be limited provided that the mitigation measures are implemented correctly and effective rehabilitation of the site is undertaken where necessary.
Description	Without Mitigation	With Mitigation		
Probability	Improbable (2)	Improbable (2)		
Duration	Short term (2)	Short term (2)		
Extent	Local (2)	Local (2)		
Magnitude	Moderate (6)	Low (4)		
Significance	20 (Low)	16 (Low)		
<i>Status (positive or negative)</i>	Negative	Negative		
Nature of impact: <u>Changes in water quality due to foreign materials and increased nutrients.</u>			<ul style="list-style-type: none"> • Ensure that no operational activities impact on the watercourse or buffer area. This includes edge effects. • Ensure that no operational activities impact on the watercourse or buffer area. This includes edge effects. 	Medium risk
Operational activities may result in the discharge of solvents				

POTENTIAL IMPACTS	PROPOSED MITIGATION	RISK OF THE IMPACT MITIGATION NOT BEING IMPLEMENTED																					
<p>and other industrial chemicals, leakage of fuel/oil from vehicles and the disposal of sewage resulting in the loss of sensitive biota in the wetlands/ivers and a reduction in watercourse function.</p> <table border="1" data-bbox="192 531 813 834"> <thead> <tr> <th>Description</th> <th>Without Mitigation</th> <th>With Mitigation</th> </tr> </thead> <tbody> <tr> <td>Probability</td> <td>Probable (3)</td> <td>Probable (3)</td> </tr> <tr> <td>Duration</td> <td>Medium term (3)</td> <td>Short term (2)</td> </tr> <tr> <td>Extent</td> <td>Regional (3)</td> <td>Local (2)</td> </tr> <tr> <td>Magnitude</td> <td>High (8)</td> <td>Low (4)</td> </tr> <tr> <td>Significance</td> <td>42 (Medium)</td> <td>24 (Low)</td> </tr> <tr> <td>Status (positive or negative)</td> <td>Negative</td> <td>Negative</td> </tr> </tbody> </table>	Description	Without Mitigation	With Mitigation	Probability	Probable (3)	Probable (3)	Duration	Medium term (3)	Short term (2)	Extent	Regional (3)	Local (2)	Magnitude	High (8)	Low (4)	Significance	42 (Medium)	24 (Low)	Status (positive or negative)	Negative	Negative	<ul style="list-style-type: none"> Regular independent water quality monitoring should form part of operational procedures in order to identify pollution Treatment of pollution identified should be prioritized accordingly. Regular clearing of debris. 	
Description	Without Mitigation	With Mitigation																					
Probability	Probable (3)	Probable (3)																					
Duration	Medium term (3)	Short term (2)																					
Extent	Regional (3)	Local (2)																					
Magnitude	High (8)	Low (4)																					
Significance	42 (Medium)	24 (Low)																					
Status (positive or negative)	Negative	Negative																					
<p>Nature of the Impact: <u>Terrestrial and riverine fauna habitat destruction and loss of habitat connectivity.</u></p> <table border="1" data-bbox="192 948 813 1267"> <thead> <tr> <th>Description</th> <th>Without Mitigation</th> <th>With Mitigation</th> </tr> </thead> <tbody> <tr> <td>Probability</td> <td>Improbable (2)</td> <td>Highly Improbable (1)</td> </tr> <tr> <td>Duration</td> <td>Temporary (1)</td> <td>Temporary (1)</td> </tr> <tr> <td>Extent</td> <td>Site (1)</td> <td>Site (1)</td> </tr> <tr> <td>Magnitude</td> <td>Low (4)</td> <td>Low (4)</td> </tr> <tr> <td>Significance</td> <td>12 (Low)</td> <td>6 (Low)</td> </tr> <tr> <td>Status (positive or negative)</td> <td>Negative</td> <td>Negative</td> </tr> </tbody> </table>	Description	Without Mitigation	With Mitigation	Probability	Improbable (2)	Highly Improbable (1)	Duration	Temporary (1)	Temporary (1)	Extent	Site (1)	Site (1)	Magnitude	Low (4)	Low (4)	Significance	12 (Low)	6 (Low)	Status (positive or negative)	Negative	Negative	<ul style="list-style-type: none"> Conduct maintenance activities during the dry season. 	Low risk
Description	Without Mitigation	With Mitigation																					
Probability	Improbable (2)	Highly Improbable (1)																					
Duration	Temporary (1)	Temporary (1)																					
Extent	Site (1)	Site (1)																					
Magnitude	Low (4)	Low (4)																					
Significance	12 (Low)	6 (Low)																					
Status (positive or negative)	Negative	Negative																					
<p>Nature of the Impact: <u>Destruction of burrowing / fossorial fauna through excavation.</u></p>	<ul style="list-style-type: none"> Maintain excavation and camp/storage areas during maintenance as small as possible to limit the area of disturbance. 	Low risk																					

POTENTIAL IMPACTS			PROPOSED MITIGATION	RISK OF THE IMPACT MITIGATION NOT BEING IMPLEMENTED
Description	Without Mitigation	With Mitigation		
Probability	Improbable (2)	Highly Improbable (1)		
Duration	Temporary (1)	Temporary (1)		
Extent	Site (1)	Site (1)		
Magnitude	Low (2)	Low (2)		
Significance	8 (Low)	4 (Low)		
Status (positive or negative)	Negative	Negative		
Nature of the Impact: <u>Destruction of Red-Listed fauna species.</u>			<ul style="list-style-type: none"> During maintenance, ensure all drivers on site and staff and contractors are informed of the importance of TOP species that may possibly occur on site through environmental awareness training. 	Low risk
Description	Without Mitigation	With Mitigation		
Probability	Highly Improbable (1)	Highly Improbable (1)		
Duration	Permanent (5)	Permanent (5)		
Extent	Local (2)	Site (1)		
Magnitude	High (10)	High (10)		
Significance	17 (Low)	16 (Low)		
Status (positive or negative)	Negative	Negative		
Nature of the Impact: <u>Pollution of faunal environments and habitats through leaks and spills of hazardous substances (hydrocarbons and chemicals), littering and dumping of waste, cement spills, sewage leaks including downstream impacts through run-off during maintenance.</u>			<ul style="list-style-type: none"> Discontinue use of all faulty machinery/ equipment on site during maintenance. Ensure no sewage leaks occur during maintenance by stopping flow or providing for diversions. All equipment / machinery will be serviced and maintained within operating specifications to prevent the risks of leak. Repairs to vehicles will be conducted off-site and where this is 	Medium risk
Description	Without Mitigation	With Mitigation		
Probability	Probable (3)	Improbable (2)		

POTENTIAL IMPACTS			PROPOSED MITIGATION	RISK OF THE IMPACT MITIGATION NOT BEING IMPLEMENTED																					
<i>Duration</i>	Temporary (1)	Temporary (1)	not possible the underlying ground will be covered with impermeable sheet and pans. <ul style="list-style-type: none"> Any machinery or equipment parked on site will either be parked on a concrete slab or have pans placed under them to collect all drips and potential leaks. Remove all materials and waste on completion of maintenance. Leave no materials behind and ensure all earth material (any excavated earth) has been levelled and rehabilitated. 																						
<i>Extent</i>	Site (1)	Site (1)																							
<i>Magnitude</i>	Moderate (6)	Low (4)																							
<i>Significance</i>	24 (Low)	12 (Low)																							
<i>Status (positive or negative)</i>	Negative	Negative																							
Nature of the Impact: <u>Clearing of vegetation.</u> <table border="1"> <thead> <tr> <th>Description</th> <th>Without Mitigation</th> <th>With Mitigation</th> </tr> </thead> <tbody> <tr> <td><i>Probability</i></td> <td>Probable (3)</td> <td>Improbable (2)</td> </tr> <tr> <td><i>Duration</i></td> <td>Short term (2)</td> <td>Temporary (1)</td> </tr> <tr> <td><i>Extent</i></td> <td>Local (2)</td> <td>Site (1)</td> </tr> <tr> <td><i>Magnitude</i></td> <td>Moderate (6)</td> <td>Low (4)</td> </tr> <tr> <td><i>Significance</i></td> <td>30 (Low)</td> <td>12 (Low)</td> </tr> <tr> <td><i>Status (positive or negative)</i></td> <td>Negative</td> <td>Negative</td> </tr> </tbody> </table>			Description	Without Mitigation	With Mitigation	<i>Probability</i>	Probable (3)	Improbable (2)	<i>Duration</i>	Short term (2)	Temporary (1)	<i>Extent</i>	Local (2)	Site (1)	<i>Magnitude</i>	Moderate (6)	Low (4)	<i>Significance</i>	30 (Low)	12 (Low)	<i>Status (positive or negative)</i>	Negative	Negative	<ul style="list-style-type: none"> Rehabilitate construction camps and any other vegetation that was impacted on by the construction. Use grass sods that were removed prior to construction to rehabilitate the construction footprints. Sods must not be stored for lengthy periods and should not be stacked on top of each other. The sods should preferably be removed during the winter months and replanted by springtime latest. Cordon off areas that are under rehabilitation as no-go areas using danger tape and steel droppers. If necessary, these areas should be fenced off to prevent vehicular or pedestrian access. Ensure that maintenance work does not take place haphazardly, but according to a fixed plan. Maintenance workers may not trample natural vegetation and work should be restricted to previously disturbed footprint. In addition, mitigation measures as set out for the construction phase should be adhered to. Address erosion donga crossings, applying soil erosion control and bank stabilisation procedures as specified by the ECO. 	Medium risk
Description	Without Mitigation	With Mitigation																							
<i>Probability</i>	Probable (3)	Improbable (2)																							
<i>Duration</i>	Short term (2)	Temporary (1)																							
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<i>Significance</i>	30 (Low)	12 (Low)																							
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POTENTIAL IMPACTS			PROPOSED MITIGATION	RISK OF THE IMPACT MITIGATION NOT BEING IMPLEMENTED																					
<p>Nature of the Impact: <u>Destruction or degradation of vegetation associated with watercourses and moist grassland.</u></p> <table border="1"> <thead> <tr> <th>Description</th> <th>Without Mitigation</th> <th>With Mitigation</th> </tr> </thead> <tbody> <tr> <td>Probability</td> <td>Probable (3)</td> <td>Improbable (2)</td> </tr> <tr> <td>Duration</td> <td>Medium term (2)</td> <td>Temporary (1)</td> </tr> <tr> <td>Extent</td> <td>Local (2)</td> <td>Site (1)</td> </tr> <tr> <td>Magnitude</td> <td>Moderate (6)</td> <td>Moderate (6)</td> </tr> <tr> <td>Significance</td> <td style="background-color: yellow;">33 (Medium)</td> <td style="background-color: green;">24 (Low)</td> </tr> <tr> <td>Status (positive or negative)</td> <td>Negative</td> <td>Negative</td> </tr> </tbody> </table>			Description	Without Mitigation	With Mitigation	Probability	Probable (3)	Improbable (2)	Duration	Medium term (2)	Temporary (1)	Extent	Local (2)	Site (1)	Magnitude	Moderate (6)	Moderate (6)	Significance	33 (Medium)	24 (Low)	Status (positive or negative)	Negative	Negative	<ul style="list-style-type: none"> • After construction, the land must be cleared of rubbish, surplus materials, and equipment, and all parts of the land must be left in a condition as close as possible to that prior to construction. • Ensure that maintenance work does not take place haphazardly, but according to a fixed plan and only within the dedicated road reserves. • Cordon off areas that are under rehabilitation as no-go areas using danger tape and steel droppers. If necessary, these areas should be fenced off to prevent vehicular and pedestrian access until such time that rehabilitation was successful. • Maintenance workers may not trample natural vegetation and work should be restricted to previously disturbed footprint. In addition, mitigation measures as set out for the construction phase should be adhered to. • Address erosion donga crossings, applying soil erosion control and bank stabilisation procedures as specified by the ECO. • Repair all erosion damage as soon as possible and in any case not later than six months before the termination of the Maintenance Period to allow for sufficient rehabilitation growth. • Stormwater drains must be maintained and regularly checked for any blockage. • Monitor rehabilitation for at least three years after construction is complete. If monitoring observed failed rehabilitation or erosion, corrective action should be taken immediately to determine the cause and correct the problem. 	Low risk
Description	Without Mitigation	With Mitigation																							
Probability	Probable (3)	Improbable (2)																							
Duration	Medium term (2)	Temporary (1)																							
Extent	Local (2)	Site (1)																							
Magnitude	Moderate (6)	Moderate (6)																							
Significance	33 (Medium)	24 (Low)																							
Status (positive or negative)	Negative	Negative																							
<p>Nature of the Impact: <u>Destruction of protected plants and</u></p>			<ul style="list-style-type: none"> • Only use indigenous species within the development gardens. 	Medium risk																					

POTENTIAL IMPACTS			PROPOSED MITIGATION	RISK OF THE IMPACT MITIGATION NOT BEING IMPLEMENTED																					
<p><u>plants of conservation concern.</u></p> <table border="1"> <thead> <tr> <th>Description</th> <th>Without Mitigation</th> <th>With Mitigation</th> </tr> </thead> <tbody> <tr> <td>Probability</td> <td>Probable (3)</td> <td>Improbable (2)</td> </tr> <tr> <td>Duration</td> <td>Long term (4)</td> <td>Temporary (1)</td> </tr> <tr> <td>Extent</td> <td>Local (2)</td> <td>Site (1)</td> </tr> <tr> <td>Magnitude</td> <td>Low (4)</td> <td>Low (2)</td> </tr> <tr> <td>Significance</td> <td>30 (Low)</td> <td>12 (Low)</td> </tr> <tr> <td>Status (positive or negative)</td> <td>Negative</td> <td>Negative</td> </tr> </tbody> </table>			Description	Without Mitigation	With Mitigation	Probability	Probable (3)	Improbable (2)	Duration	Long term (4)	Temporary (1)	Extent	Local (2)	Site (1)	Magnitude	Low (4)	Low (2)	Significance	30 (Low)	12 (Low)	Status (positive or negative)	Negative	Negative	<ul style="list-style-type: none"> The relocated species should be monitored for at least two years post relocation. If die back is noted, a specialist should be consulted and corrective action taken as soon as possible. No operational activities are allowed to impact on the relocated species. 	
Description	Without Mitigation	With Mitigation																							
Probability	Probable (3)	Improbable (2)																							
Duration	Long term (4)	Temporary (1)																							
Extent	Local (2)	Site (1)																							
Magnitude	Low (4)	Low (2)																							
Significance	30 (Low)	12 (Low)																							
Status (positive or negative)	Negative	Negative																							
<p>Nature of the Impact: <u>Potential increase in invasive vegetation.</u></p> <table border="1"> <thead> <tr> <th>Description</th> <th>Without Mitigation</th> <th>With Mitigation</th> </tr> </thead> <tbody> <tr> <td>Probability</td> <td>Probable (3)</td> <td>Improbable (2)</td> </tr> <tr> <td>Duration</td> <td>Long term (4)</td> <td>Short term (2)</td> </tr> <tr> <td>Extent</td> <td>Local (2)</td> <td>Site (1)</td> </tr> <tr> <td>Magnitude</td> <td>Low (4)</td> <td>Low (2)</td> </tr> <tr> <td>Significance</td> <td>30 (Low)</td> <td>10 (Low)</td> </tr> <tr> <td>Status (positive or negative)</td> <td>Negative</td> <td>Negative</td> </tr> </tbody> </table>			Description	Without Mitigation	With Mitigation	Probability	Probable (3)	Improbable (2)	Duration	Long term (4)	Short term (2)	Extent	Local (2)	Site (1)	Magnitude	Low (4)	Low (2)	Significance	30 (Low)	10 (Low)	Status (positive or negative)	Negative	Negative	<ul style="list-style-type: none"> Only use indigenous species within the development gardens. Monitor and control the grassland and remove alien invasive species as soon as they become apparent. 	Low risk
Description	Without Mitigation	With Mitigation																							
Probability	Probable (3)	Improbable (2)																							
Duration	Long term (4)	Short term (2)																							
Extent	Local (2)	Site (1)																							
Magnitude	Low (4)	Low (2)																							
Significance	30 (Low)	10 (Low)																							
Status (positive or negative)	Negative	Negative																							
<p>Nature of the Impact: <u>Clearing of land for construction camps and potential pollution of the soil and water.</u></p> <table border="1"> <thead> <tr> <th>Description</th> <th>Without Mitigation</th> <th>With Mitigation</th> </tr> </thead> <tbody> <tr> <td>Probability</td> <td>Probable (3)</td> <td>Improbable (2)</td> </tr> <tr> <td>Duration</td> <td>Short term (2)</td> <td>Temporary (1)</td> </tr> <tr> <td>Extent</td> <td>Local (2)</td> <td>Site (1)</td> </tr> </tbody> </table>			Description	Without Mitigation	With Mitigation	Probability	Probable (3)	Improbable (2)	Duration	Short term (2)	Temporary (1)	Extent	Local (2)	Site (1)	<ul style="list-style-type: none"> Monitor all sites disturbed by construction activities for colonisation by exotics or invasive plants and control these as they emerge. Monitoring should continue for at least two years after construction is complete. 	Low risk									
Description	Without Mitigation	With Mitigation																							
Probability	Probable (3)	Improbable (2)																							
Duration	Short term (2)	Temporary (1)																							
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POTENTIAL IMPACTS			PROPOSED MITIGATION	RISK OF THE IMPACT MITIGATION NOT BEING IMPLEMENTED																					
<i>Magnitude</i>	Moderate (6)	Low (4)																							
<i>Significance</i>	30 (Low)	12 (Low)																							
<i>Status (positive or negative)</i>	Negative	Negative																							
<p>Nature of the Impact: <u>Exposure to erosion and subsequent sedimentation or pollution of proximate watercourses.</u></p> <table border="1"> <thead> <tr> <th>Description</th> <th>Without Mitigation</th> <th>With Mitigation</th> </tr> </thead> <tbody> <tr> <td><i>Probability</i></td> <td>Probable (3)</td> <td>Improbable (2)</td> </tr> <tr> <td><i>Duration</i></td> <td>Medium term (3)</td> <td>Short term (2)</td> </tr> <tr> <td><i>Extent</i></td> <td>Local (2)</td> <td>Site (1)</td> </tr> <tr> <td><i>Magnitude</i></td> <td>Moderate (6)</td> <td>Low (4)</td> </tr> <tr> <td><i>Significance</i></td> <td>33 (Medium)</td> <td>14 (Low)</td> </tr> <tr> <td><i>Status (positive or negative)</i></td> <td>Negative</td> <td>Negative</td> </tr> </tbody> </table>			Description	Without Mitigation	With Mitigation	<i>Probability</i>	Probable (3)	Improbable (2)	<i>Duration</i>	Medium term (3)	Short term (2)	<i>Extent</i>	Local (2)	Site (1)	<i>Magnitude</i>	Moderate (6)	Low (4)	<i>Significance</i>	33 (Medium)	14 (Low)	<i>Status (positive or negative)</i>	Negative	Negative	<ul style="list-style-type: none"> • Cordon off areas that are under rehabilitation as no-go areas using danger tape and steel droppers. If necessary, these areas should be fenced off to prevent vehicular and pedestrian access where needed. • Monitor rehabilitation and ensure that rehabilitated areas do not erode. • If monitoring finds that indigenous vegetation from the surrounding grasslands are not colonising the site, implement a re-vegetation plan to ensure that grass species that naturally occur in the Soweto Highveld Grassland, are sowed in order to re-establish indigenous plant cover. 	Medium risk
Description	Without Mitigation	With Mitigation																							
<i>Probability</i>	Probable (3)	Improbable (2)																							
<i>Duration</i>	Medium term (3)	Short term (2)																							
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<i>Significance</i>	33 (Medium)	14 (Low)																							
<i>Status (positive or negative)</i>	Negative	Negative																							
<p>Nature of the Impact: <u>Loss and disturbance of heritage sites due to the development</u></p> <table border="1"> <thead> <tr> <th>Description</th> <th>Without Mitigation</th> <th>With Mitigation</th> </tr> </thead> <tbody> <tr> <td><i>Probability</i></td> <td>Very improbable (1)</td> <td>Very improbable (1)</td> </tr> <tr> <td><i>Duration</i></td> <td>Permanent (4)</td> <td>Permanent (4)</td> </tr> <tr> <td><i>Extent</i></td> <td>Site (1)</td> <td>Site (1)</td> </tr> <tr> <td><i>Magnitude</i></td> <td>Minor (2)</td> <td>Minor (2)</td> </tr> <tr> <td><i>Significance</i></td> <td>7 (Low)</td> <td>7 (Low)</td> </tr> <tr> <td><i>Status (positive or negative)</i></td> <td>Negative</td> <td>Negative</td> </tr> </tbody> </table>			Description	Without Mitigation	With Mitigation	<i>Probability</i>	Very improbable (1)	Very improbable (1)	<i>Duration</i>	Permanent (4)	Permanent (4)	<i>Extent</i>	Site (1)	Site (1)	<i>Magnitude</i>	Minor (2)	Minor (2)	<i>Significance</i>	7 (Low)	7 (Low)	<i>Status (positive or negative)</i>	Negative	Negative	<ul style="list-style-type: none"> • Should graves, fossils or any archaeological artefacts be identified during construction, work on the area where the artefacts were found, must cease immediately and it should immediately be reported to a heritage practitioner or local museum so that an investigation and evaluation of the finds can be made. 	Low risk anticipated provided that the mitigation measures are implemented correctly.
Description	Without Mitigation	With Mitigation																							
<i>Probability</i>	Very improbable (1)	Very improbable (1)																							
<i>Duration</i>	Permanent (4)	Permanent (4)																							
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<i>Significance</i>	7 (Low)	7 (Low)																							
<i>Status (positive or negative)</i>	Negative	Negative																							

POTENTIAL IMPACTS	PROPOSED MITIGATION	RISK OF THE IMPACT MITIGATION NOT BEING IMPLEMENTED																					
<p>As no sites, features or objects of cultural significance are known to exist in the development area, there would be no impact as a result of the proposed development.</p>																							
<p>Nature of Impact: <u>Dust Generation</u></p> <p>Construction machinery and heavy vehicles during maintenance which will likely make use of the existing gravel roads to transport equipment and material to the site are likely to generate dust which is likely to be perceptible by adjacent residents and the watercourse. Trucks may potentially distribute dust along internal access roads as well as into the watercourse given the nature of maintenance activities.</p> <p>Source of Impact:</p> <ul style="list-style-type: none"> • Construction vehicles. • Machinery used for maintenance. <table border="1" data-bbox="192 1018 813 1329"> <thead> <tr> <th>Description</th> <th>Without Mitigation</th> <th>With Mitigation</th> </tr> </thead> <tbody> <tr> <td>Probability</td> <td>Probable (3)</td> <td>Improbable (2)</td> </tr> <tr> <td>Duration</td> <td>Temporary (1)</td> <td>Temporary (1)</td> </tr> <tr> <td>Extent</td> <td>Local (2)</td> <td>Local (2)</td> </tr> <tr> <td>Magnitude</td> <td>Moderate (6)</td> <td>Low (4)</td> </tr> <tr> <td>Significance</td> <td style="background-color: #00FF00;">27 (Low)</td> <td style="background-color: #00FF00;">14 (Low)</td> </tr> <tr> <td>Status (positive or negative)</td> <td>Negative</td> <td>Negative</td> </tr> </tbody> </table>	Description	Without Mitigation	With Mitigation	Probability	Probable (3)	Improbable (2)	Duration	Temporary (1)	Temporary (1)	Extent	Local (2)	Local (2)	Magnitude	Moderate (6)	Low (4)	Significance	27 (Low)	14 (Low)	Status (positive or negative)	Negative	Negative	<ul style="list-style-type: none"> • Dust suppression and wet spraying should be implemented during maintenance works. • Limit maintenance hours to daytime and weekdays. • Speed limits should be enforced to ensure that the generation of dust by construction vehicles during maintenance are limited. 	<p>Low risk</p>
Description	Without Mitigation	With Mitigation																					
Probability	Probable (3)	Improbable (2)																					
Duration	Temporary (1)	Temporary (1)																					
Extent	Local (2)	Local (2)																					
Magnitude	Moderate (6)	Low (4)																					
Significance	27 (Low)	14 (Low)																					
Status (positive or negative)	Negative	Negative																					

POTENTIAL IMPACTS	PROPOSED MITIGATION	RISK OF THE IMPACT MITIGATION NOT BEING IMPLEMENTED																					
<p>Nature of Impact: <u>Noise</u></p> <p>Source of Impact:</p> <ul style="list-style-type: none"> Construction vehicles during maintenance. Equipment and machinery during maintenance. <table border="1" data-bbox="190 518 813 834"> <thead> <tr> <th>Description</th> <th>Without Mitigation</th> <th>With Mitigation</th> </tr> </thead> <tbody> <tr> <td>Probability</td> <td>Definite (5)</td> <td>Definite (4)</td> </tr> <tr> <td>Duration</td> <td>Short term (2)</td> <td>Temporary (1)</td> </tr> <tr> <td>Extent</td> <td>Local (2)</td> <td>Local (2)</td> </tr> <tr> <td>Magnitude</td> <td>Moderate (6)</td> <td>Low (4)</td> </tr> <tr> <td>Significance</td> <td>50 (Medium)</td> <td>28 (Medium)</td> </tr> <tr> <td>Status (positive or negative)</td> <td>Negative</td> <td>Negative</td> </tr> </tbody> </table>	Description	Without Mitigation	With Mitigation	Probability	Definite (5)	Definite (4)	Duration	Short term (2)	Temporary (1)	Extent	Local (2)	Local (2)	Magnitude	Moderate (6)	Low (4)	Significance	50 (Medium)	28 (Medium)	Status (positive or negative)	Negative	Negative	<ul style="list-style-type: none"> Inform residents of planned maintenance works. Maintenance and the use of construction machinery should be limited between 06h00 and 18h00 on weekdays only. Institute noise control measures throughout maintenance periods. Maintenance activities must abide by the national noise laws and the municipal noise by-laws with regard to the abatement of noise caused by mechanical equipment. Speed limits must be adhered to. 	<p>High risk unless mitigation measures are implemented correctly and effectively.</p>
Description	Without Mitigation	With Mitigation																					
Probability	Definite (5)	Definite (4)																					
Duration	Short term (2)	Temporary (1)																					
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Magnitude	Moderate (6)	Low (4)																					
Significance	50 (Medium)	28 (Medium)																					
Status (positive or negative)	Negative	Negative																					
<p>Nature of Impact: <u>Visual</u></p> <table border="1" data-bbox="190 909 813 1257"> <thead> <tr> <th>Description</th> <th>Without Enhancement</th> <th>With Enhancement</th> </tr> </thead> <tbody> <tr> <td>Probability</td> <td>Highly probable (4)</td> <td>Definite (5)</td> </tr> <tr> <td>Duration</td> <td>Long term (4)</td> <td>Long term (4)</td> </tr> <tr> <td>Extent</td> <td>Local (2)</td> <td>Local (2)</td> </tr> <tr> <td>Magnitude</td> <td>Moderate (6)</td> <td>High (8)</td> </tr> <tr> <td>Significance</td> <td>48 (Medium)</td> <td>70 (High)</td> </tr> <tr> <td>Status (positive or negative)</td> <td>Positive</td> <td>Positive</td> </tr> </tbody> </table>	Description	Without Enhancement	With Enhancement	Probability	Highly probable (4)	Definite (5)	Duration	Long term (4)	Long term (4)	Extent	Local (2)	Local (2)	Magnitude	Moderate (6)	High (8)	Significance	48 (Medium)	70 (High)	Status (positive or negative)	Positive	Positive	<ul style="list-style-type: none"> Regular maintenance. 	<p>Medium</p>
Description	Without Enhancement	With Enhancement																					
Probability	Highly probable (4)	Definite (5)																					
Duration	Long term (4)	Long term (4)																					
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Magnitude	Moderate (6)	High (8)																					
Significance	48 (Medium)	70 (High)																					
Status (positive or negative)	Positive	Positive																					
<p>Nature of Impact: <u>Safety</u></p>	<ul style="list-style-type: none"> Regular maintenance. 	<p>Medium</p>																					

POTENTIAL IMPACTS			PROPOSED MITIGATION	RISK OF THE IMPACT MITIGATION NOT BEING IMPLEMENTED																					
No sewage leakages as a result of burst pipes. <table border="1"> <thead> <tr> <th>Description</th> <th>Without Enhancement</th> <th>With Enhancement</th> </tr> </thead> <tbody> <tr> <td><i>Probability</i></td> <td>Probable (3)</td> <td>Highly Probable (4)</td> </tr> <tr> <td><i>Duration</i></td> <td>Long term (4)</td> <td>Long term (4)</td> </tr> <tr> <td><i>Extent</i></td> <td>Local (2)</td> <td>Local (2)</td> </tr> <tr> <td><i>Magnitude</i></td> <td>Moderate (6)</td> <td>High (8)</td> </tr> <tr> <td><i>Significance</i></td> <td>36 (Medium)</td> <td>56 (Medium)</td> </tr> <tr> <td><i>Status (positive or negative)</i></td> <td>Positive</td> <td>Positive</td> </tr> </tbody> </table>			Description	Without Enhancement	With Enhancement	<i>Probability</i>	Probable (3)	Highly Probable (4)	<i>Duration</i>	Long term (4)	Long term (4)	<i>Extent</i>	Local (2)	Local (2)	<i>Magnitude</i>	Moderate (6)	High (8)	<i>Significance</i>	36 (Medium)	56 (Medium)	<i>Status (positive or negative)</i>	Positive	Positive		
Description	Without Enhancement	With Enhancement																							
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<i>Significance</i>	36 (Medium)	56 (Medium)																							
<i>Status (positive or negative)</i>	Positive	Positive																							
<p>Nature of impact: <u>Socioeconomic</u></p> <p>Source of Impact:</p> <ul style="list-style-type: none"> Overall upliftment of the area. <table border="1"> <thead> <tr> <th>Description</th> <th>Without Enhancement</th> <th>With Enhancement</th> </tr> </thead> <tbody> <tr> <td><i>Probability</i></td> <td>Probable (3)</td> <td>Highly Probable (4)</td> </tr> <tr> <td><i>Duration</i></td> <td>Long term (4)</td> <td>Long term (4)</td> </tr> <tr> <td><i>Extent</i></td> <td>Local (2)</td> <td>Local (2)</td> </tr> <tr> <td><i>Magnitude</i></td> <td>Moderate (6)</td> <td>Moderate (6)</td> </tr> <tr> <td><i>Significance</i></td> <td>36 (Medium)</td> <td>48 (Medium)</td> </tr> <tr> <td><i>Status (positive or negative)</i></td> <td>Positive</td> <td>Positive</td> </tr> </tbody> </table>			Description	Without Enhancement	With Enhancement	<i>Probability</i>	Probable (3)	Highly Probable (4)	<i>Duration</i>	Long term (4)	Long term (4)	<i>Extent</i>	Local (2)	Local (2)	<i>Magnitude</i>	Moderate (6)	Moderate (6)	<i>Significance</i>	36 (Medium)	48 (Medium)	<i>Status (positive or negative)</i>	Positive	Positive	<ul style="list-style-type: none"> Regular maintenance 	Medium
Description	Without Enhancement	With Enhancement																							
<i>Probability</i>	Probable (3)	Highly Probable (4)																							
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<i>Significance</i>	36 (Medium)	48 (Medium)																							
<i>Status (positive or negative)</i>	Positive	Positive																							

NO GO

No go Alternative (compulsory). This is the option of not upgrading and replacing the water pipeline in Hamberg. This option will result in limited impacts already occurring in the study area. However, should the infrastructure not be developed as proposed, community upliftment will fail to occur. This is an undesirable option for the project as it will pose negative impacts on the social and economic perspective and is not considered desirable. The negative impacts of the no go option alternative are considered to outweigh the positive impacts of this alternative. The no go option is therefore not preferred.

Table 11: Potential impacts should the Development not be Approved (“No-Go” Alternative)

Potential impacts:	Significance rating of impacts (positive or negative):	Proposed mitigation:	Significance rating of impacts after mitigation:	Risk of the impact and mitigation not being implemented
Changing the quantity and fluctuation properties of the watercourse – No-go would mean study site status quo is maintained.	P – High	There are no mitigation measures	P – High	Low risk
Changes in sediment entering and exiting the system – No-go would mean study site status quo is maintained.	P – High	There are no mitigation measures	P – High	Low risk
Introduction and spread of alien vegetation – No-go would mean study site status quo is maintained.	P – Medium	There are no mitigation measures	P – Medium	Low risk
Loss and disturbance of watercourse habitat and fringe vegetation – No-go would mean study site status quo is maintained.	P – Medium	There are no mitigation measures	P – Medium	Low risk
Changes in water quality due to foreign materials and increased nutrients – No-go would mean study site status quo is maintained.	P – Medium	There are no mitigation measures	P – Medium	Low risk
Terrestrial and riverine fauna habitat destruction and loss of habitat connectivity – No-go would mean study	P – Low	There are no mitigation measures	P – Low	Low risk

site status quo is maintained.				
Destruction of burrowing / fossorial fauna through excavation – No-go would mean study site status quo is maintained.	P – Low	There are no mitigation measures	P – Low	Low risk
Destruction of Red-Listed fauna species – No-go would mean study site status quo is maintained.	P – Low	There are no mitigation measures	P – Low	Low risk
Disturbance to fauna through noise, vibration, dust and emigration of fauna from site, and resulting influx of fauna to neighbouring areas – No-go would mean study site status quo is maintained.	P – Low	There are no mitigation measures	P – Low	Low risk
Attraction of pests and exotic/ alien species – No-go would mean study site status quo is maintained.	P – Low	There are no mitigation measures	P – Low	Low risk
Hindrance, trapping, killing of fauna – No-go would mean study site status quo is maintained.	P – Low	There are no mitigation measures	P – Low	Low risk
Pollution of faunal environments and habitats through leaks and spills of hazardous substances (hydrocarbons and chemicals), littering and dumping of waste, cement spills, sewage leaks including downstream impacts through run-off – No-go would mean study site status quo is maintained.	P – Low	There are no mitigation measures	P – Low	Low risk
Clearing of vegetation – No-go would mean study site status quo is maintained.	P – Medium	There are no mitigation measures	P – Medium	Low risk
Destruction or degradation of vegetation associated with watercourses and moist grassland – No-go would mean study site status quo is maintained.	P – Medium	There are no mitigation measures	P – Medium	Low risk
Destruction of protected plants and plants of conservation concern – No-go would mean study site status quo is maintained.	P – Medium	There are no mitigation measures	P – Medium	Low risk
Potential increase in invasive vegetation – No-go would mean study site status quo is maintained.	P – Medium	There are no mitigation measures	P – Medium	Low risk

Clearing of land for construction camps and potential pollution of the soil and water – No-go would mean study site status quo is maintained.	P – Medium	There are no mitigation measures	P – Medium	Low risk
Exposure to erosion and subsequent sedimentation or pollution of proximate watercourses – No-go would mean study site status quo is maintained.	P – Medium	There are no mitigation measures	P – Medium	Low risk
Loss and disturbance of heritage sites – No-go would imply no heritage sites or artefacts will be disturbed.	P – Low	There are no mitigation measures	P – Low	Low risk No heritage artefacts are expected to be in the study area in its current state.
Crime, safety and security: during construction – No-go would imply that the area remains as is.	P – High	There are no mitigation measures	P – High	Low risk
Dust generation – No-go would mean study site status quo is maintained.	P – High	There are no mitigation measures	P – High	Low risk
Noise – No-go would imply no construction noise and no added noise during operation.	P – High	There are no mitigation measures	P – High	Low risk
Socioeconomic impacts anticipated during the construction period – No-go would mean no local job opportunities for general and skilled labourers as well as no opportunities for local retailers.	N – High	Replacement and upgrading of the water pipeline will provide job opportunities for locals and for local retailers.	N – High	High risk
Socioeconomic impacts anticipated during the operational period – No-go would mean that overall community upliftment will not occur.	N – High	Replacement and upgrading of the water pipeline will allow for complete functioning of water system with a lowered risk of bursts and leaks.	N – High	High risk
Traffic and accessibility – No-go would imply that residents continue using the affected Streets without traffic hindrance.	P – High	There are no mitigation measures	P – High	Low risk
Visual: during construction – No-go would imply that the study site will remain as is.	P – Medium	There are no mitigation measures	P – Medium	Low risk

Visual: during operation – No-go would imply the study site will remain as is.	N – High	A fully operational water system will not allow for bursts and leaks and the resultant overflow especially at manholes.	N – High	High risk
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In terms of the “No-Go” Alternative, if the activity is refused an Approval there will be no impacts as a result of construction activities. If the no go alternative is pursued, then the positive impacts will not be realised, no jobs will be created, the water pipeline will remain as is and community upliftment will fail to occur. This alternative will not be feasible as the Applicant is providing a service to the local community. In this regard, there is a motivation for the activity.

List any specialist reports that were used to fill in the above tables. Such reports are to be attached in the appropriate Appendix.

- Appendix G1 – Wetland/Riparian Delineation and Functional Assessment
- Appendix G1(i) – General Wetland Rehabilitation and Monitoring Plan
- Appendix G2 – Terrestrial Fauna Impact Assessment and Management Plan
- Appendix G3 – Vegetation Assessment
- Appendix G4 – Heritage Impact Assessment

Describe any gaps in knowledge or assumptions made in the assessment of the environment and the impacts associated with the proposed development.

No gaps in knowledge have been identified at this stage.

The following assumptions are made:

- The information on which the report is based (i.e. project information) is correct.
- The construction, operation and management of this proposed development will be in line with the recommendations in this report, which will be enforced by the implementation of a detailed Environmental Management Programme. Much of the long-term success lies in the effective implementation of the measures prescribed in the EMP.

3. IMPACTS THAT MAY RESULT FROM THE DECOMMISSIONING AND CLOSURE PHASE

Briefly describe and compare the potential impacts (as appropriate), +significance rating of impacts, proposed mitigation and significance rating of impacts after mitigation that are likely to occur as a result of the decommissioning and closure phase for the various alternatives of the proposed development. This must include an assessment of the significance of all impacts.

Proposed

Potential impacts:	Significance rating of impacts(positive or negative):	Proposed mitigation:	Significance rating of impacts after mitigation:	Risk of the impact and mitigation not being implemented
Decommissioning and closure phase has not been considered as part of this application as the end use of the site and required decommissioning activities are not known at this time. It is therefore not possible to predict the potential environmental impacts. In addition, it is unlikely that decommissioning will be contemplated due to the nature of the development. If decommissioning phase is considered in future, the developer will undertake the required actions as prescribed by the legislation at the time and comply with all relevant requirements administered by any relevant authority and competent authority at that time.				

List any specialist reports that were used to fill in the above tables. Such reports are to be attached in the appropriate Appendix.



Where applicable indicate the detailed financial provisions for rehabilitation, closure and ongoing post decommissioning management for the negative environmental impacts.

Specialist studies for decommissioning and closure phase will be undertaken at the time when decommissioning is contemplated by the developer.

4. CUMULATIVE IMPACTS

Describe potential impacts that, on their own may not be significant, but is significant when added to the impact of other activities or existing impacts in the environment. Substantiate response:

Cumulative impacts can result from actions which may not be significant on their own but which are significant when added to the impact of other similar actions. The anticipated cumulative impacts of this development (for all alternatives) includes the following:

- **Impacts on the Wetland**

Impacts associated with construction could increase the significance of this impact already present as a result of other activities in the area such as dumping; erosion and pollution input and infilling are amongst the most significant impact. Some changes in the hydrology of the wetlands could occur due to ineffective sediment control and rehabilitation. It is imperative that effective protective measures should be put into place and monitored. A rehabilitation plan should be put into action should any degradation be observed as a result of stormwater or sediment input. Increases in stormwater flows will definitely cause permanent degradation downstream unless mitigated at the design level.

- **Destruction or degradation of vegetation associated with watercourses, protected plants and plants of conservation concern**

Loss of functionality of the vegetation within the watercourse, as well as erosion due to edge effects. If mitigation measures are adequately implemented, no cumulative impacts are expected.

- **Exposure to erosion and subsequent sedimentation or pollution of proximate watercourses**

Erosion within the Hamberg area will degrade the vegetation and lead to the colonisation by alien invasive plant species. Possible contamination of wetlands and/or groundwater reserves due to hydrocarbon or other spillage and an increase of modified areas (together with surrounding developments) that will affect flora population dynamics and runoff patterns.

- **Direct impact on species richness and loss of habitat (fauna)**

Construction and operational activities may result in cumulative impact to the traditional migration routes of mammals, reptiles and especially frogs on the study site and on adjacent properties. Altered population dynamics

of natural indigenous species could cause significant impact on overall faunal community structure and alter natural food-chains. It is imperative that effective protective measures should be put into place to protect wetlands and their buffer areas. The increased roads and traffic will definitely cause permanent disruption of migration routes unless mitigation takes place.

- **Potential increase/Removal in invasive vegetation**

If mitigation measures to limit and prevent the spread of alien species are not implemented, the cumulative impact could lead to remaining natural vegetation transformed by alien plant species. The removal and sustained low or no infestation with alien invasive species will have a positive cumulative impact as the seed source of these species within the area will be reduced.

- **Cumulative Impacts on traffic congestion**

Traffic accommodation is required for construction activities affecting the travelled way as well as the sidewalks of the travelled way. If any road closure is expected, "Stop and Go" will be used for traffic accommodation. In the case of complete road closure, traffic diversion must be accommodated for.

- **Increased socio-economic upliftment as a result of the proposed development**

Constructing the proposed development will result in direct jobs being created during the proposed upgrade and replacement of the pipeline. The water pipeline in the area will be more resistant and long lasting with lowered risk of bursts.

Responsible environmental management will be required during the entire project life cycle. These management measures should be guided by the Environmental Management Programme (EMPr), attached as **Appendix H**.

5. ENVIRONMENTAL IMPACT STATEMENT

Taking the assessment of potential impacts into account, please provide an environmental impact statement that sums up the impacts that the proposal 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.

Proposal (preferred alternative)

The proposed activities assessed within this Basic Assessment Report are required to provide essential information associated with the proposed replacement and upgrade that may impact on the environment. In summary, the Basic Assessment has assessed potential impacts and identified appropriate management and mitigation measures. No environmental fatal flaws and no significant negative impacts have been identified to be associated with the proposed activities. The Impact Assessment section of this report indicates that the identified environmental impacts associated can be effectively mitigated to have a low significance impact rating provided

the recommended mitigation and management measures are implemented.

Environmental cost that can be expected to arise as a result of the project proceeding for all alternatives include:

Disturbance of the wetland

- Riparian areas may be disrupted during the construction phase.

Benefits of the project include the following:

- The proposed development will negate the problem of water pipe bursts and leaks and resultant overflow especially at manholes.
- The proposed development will result in important economic benefits at the local and regional scale through job creation, procurement of materials for construction and provision of services and other associated economic development at local and regional scale. These will extend beyond the site and would be experienced at local and regional scale.
- Overall community upliftment will occur as a required service will be fully functional in operation.

The benefits of the project are expected to outweigh the costs.

A number of mitigation and monitoring measures have been identified which would allow for the minimisation and management of potential environmental impacts associated with the proposed development, which have been incorporated into the EMPr (**Appendix H**) for the project, which will be further developed during the detailed planning and construction phase of the project.

It is the opinion of Envirolution Consulting (Pty) Ltd that the proposed project will not have a significant environmental impact and is therefore preferred as it is considered to be sustainable from an environmental perspective.

No-go (compulsory)

This is the option of not replacing and upgrading the water pipe and associated infrastructure. This option will result in limited impacts already occurring in the study area. However, should the infrastructure not be replaced and upgraded as proposed, the social benefits (JW's objectives) associated with the proposed activities will not be addressed. This is an undesirable option for the project as it will not only pose negative impacts on the social perspective, but on the economic perspective as well. The no go option is therefore not preferred.

6. IMPACT SUMMARY OF THE PROPOSAL OR PREFERRED ALTERNATIVE

Table 12: Impact Summary table

Construction Phase				
Negative Environmental Impacts	Method Alternative 1: Construction of uPVC pipe using open trenching method (Preferred)		Method Alternative 2: Construction of HDPE pipes using Horizontal Directional Drilling (HDD) method	
	Without Mitigation	With Mitigation	Without Mitigation	With Mitigation
Changing the quantity and fluctuation properties of the watercourse.	Medium	Low	Medium	Low
Changes in sediment entering and exiting the system.	Medium	Low	Medium	Low
Introduction and spread of alien vegetation.	Medium	Low	Medium	Low
Loss and disturbance of watercourse habitat and fringe vegetation.	Medium	Low	Medium	Low
Changes in water quality due to foreign materials and increased nutrients.	Medium	Medium	Medium	Low
Terrestrial and riverine fauna habitat destruction and loss of habitat.	Medium	Low	Low	Low
Destruction of burrowing / fossorial fauna through excavation.	Low	Low	Low	Low
Destruction of Red-Listed fauna species.	Low	Low	Low	Low
Disturbance to fauna through noise, vibration, dust and emigration of fauna from site, and resulting influx of fauna to neighbouring areas.	Medium	Low	Low	Low

Attraction of pests and exotic/ alien species.	Medium	Low	Medium	Low
Hindrance, trapping, killing of fauna.	Low	Low	Low	Low
Pollution of faunal environments and habitats through leaks and spills of hazardous substances (hydrocarbons and chemicals), littering and dumping of waste, cement spills, sewage leaks including downstream impacts through run-off.	Medium	Low	Medium	Low
Clearing of vegetation.	Medium	Low	Low	Low
Destruction or degradation of vegetation associated with watercourses and moist grassland.	High	Low	High	Low
Destruction of protected plants and plants of conservation concern.	Medium	Low	Medium	Low
Potential increase in invasive vegetation.	Medium	Low	Medium	Low
Clearing of land for construction camps and potential pollution of the soil and water.	Medium	Low	Medium	Low
Exposure to erosion and subsequent sedimentation or pollution of proximate watercourses.	Medium	Low	Medium	Low
Loss and disturbance of heritage sites.	Low	Low	Low	Low
Crime, safety and security.	Medium	Low	Medium	Low
Dust generation.	High	Medium	Medium	Low
Noise	High	Medium	Medium	Medium
Traffic and accessibility.	Medium	Medium	Medium	Medium
Visual	High	Medium	Medium	Medium
Operation Phase				

Nature of Impact	Method Alternative 1: Construction of uPVC pipe using open trenching method (Preferred)		Method Alternative 2: Construction of HDPE pipes using Horizontal Directional Drilling (HDD) method	
	Without Mitigation	With Mitigation	Without Mitigation	Without Mitigation
Changing the quantity and fluctuation properties of the watercourse.	Low	Low	Low	Low
Changes in sediment entering and exiting the system.	Low	Low	Low	Low
Introduction and spread of alien vegetation.	Medium	Low	Medium	Low
Loss and disturbance of watercourse habitat and fringe vegetation.	Low	Low	Low	Low
Changes in water quality due to foreign materials and increased nutrients.	Medium	Medium	Medium	Medium
Terrestrial and riverine fauna habitat destruction and loss of habitat.	Low	Low	Low	Low
Destruction of burrowing / fossorial fauna through excavation.	Low	Low	Low	Low
Destruction of Red-Listed fauna species.	Low	Low	Low	Low
Pollution of faunal environments and habitats through leaks and spills of hazardous substances (hydrocarbons and chemicals), littering and dumping of waste, cement spills, sewage leaks including downstream impacts through run-off.	Medium	Low	Low	Low
Clearing of vegetation.	Low	Low	Low	Low
Destruction or degradation of vegetation associated with watercourses and moist	Low	Low	Medium	Low

grassland				
Destruction of protected plants and plants of conservation concern.	Low	Low	Low	Low
Potential increase in invasive vegetation.	Low	Low	Low	Low
Clearing of land for construction camps and potential pollution of the soil and water.	Low	Low	Low	Low
Exposure to erosion and subsequent sedimentation or pollution of proximate watercourses.	Medium	Low	Medium	Low
Loss and disturbance of heritage sites.	Low	Low	Low	Low
Dust generation.	Low	Low	Low	Low
Noise	Medium	Medium	Medium	Medium
Positive Environmental Impacts	Method Alternative 1: Construction of uPVC pipe using open trenching method (Preferred)		Method Alternative 2: Construction of HDPE pipes using Horizontal Directional Drilling (HDD) method	
	Without Enhancement	With Enhancement	Without Enhancement	With Enhancement
Socioeconomic impacts anticipated during construction phase	Low	Medium	Low	Medium
Socioeconomic impacts anticipated during operational phase	Medium	Medium	Medium	Medium
Visual impacts anticipated during operational phase	Medium	High	Medium	High
Safety during operational phase	Medium	Medium	Medium	Medium

7. SPATIAL DEVELOPMENT TOOLS

Indicate the application of any spatial development tool protocols on the proposed development and the outcome thereof.

Arc GIS was used as a spatial development tool to determine the presence of:

- Rivers and wetlands (and associated buffers);
- CBA Areas (ecological support areas and protected areas);
- Ridges;
- Geology and Soils; and
- Land Use cover

8. RECOMMENDATION OF THE 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 as bound by professional ethical standards and the code of conduct of EAPASA).

YES

If "NO", indicate the aspects that require further assessment 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:

A number of mitigation and monitoring measures have been identified which would allow for the minimisation and management of potential environmental impacts associated with the proposed development. These have been incorporated into the EMPr (**Appendix H**).

This Report has identified and assessed the potential impacts on the environment associated with the proposed replacement and upgrade of the water pipe and associated infrastructure in Hamberg. It is therefore proposed that authorisation is granted.

The project will result in some unavoidable environmental impacts during construction but this is not a fatal flaw. The nature of the project has been planned in such a way that there are minimal negative environmental impacts. None of these adverse impacts are considered unacceptably significant and all can be managed to acceptable levels through the effective implementation of the recommended mitigation measures. In addition, the project will provide benefits to the local community in terms of service provision and safety.

It is important to note the following:

The preferred construction method is the installation of uPVC pipes using open trenching method (this method

makes up 90% of the proposed works). However, the HDD method will only be performed on road crossings as well as places where damaging other infrastructure on the pipeline route will be avoided.

Due to the crossing of a stream at certain sections using a hanging pipe, a steel or Glass Reinforced Pipes (GRP) shall be used supported by concrete columns and gabions. There will be minor excavations at the stream banks due to construction of columns and installation of gabions.

Envirovolution is in favour of Method Alternative 1: Construction of uPVC pipe using open trenching method (Preferred) in relation to Method Alternative 2: Construction of HDPE pipes using Horizontal Directional Drilling (HDD) method as Alternative 1 allows for the installation of a new pipeline that satisfies the requirements required. It provides a larger cross sectional area to work in and is suitable method for severely damaged underground pipelines. Unlike Alternative 2 that requires a "holding" pipe for passage, the traditional open cut excavation method can easily install a new pipe. Alternative 1 is very labour intensive and will encourage local labourers to participate in the project since it is not necessarily a specialised method of construction. The duration of construction is however longer for Alternative 1 and includes more excavation than Alternative 2 which further implies more environmental disturbance; the project supports the community for a longer period of time. Both alternatives require works along the affected streets and may cause traffic disturbance during the construction phase.

Based on the assumption Envirovolution believes through effective implementation of the stipulated mitigation measures, the adverse impacts can be reduced. With the proposed mitigation measures, GDARD may agree that the project's benefits outweigh the potential negative impacts.

General Recommendations

Envirovolution Consulting (Pty) Ltd recommends that Method Alternative 1: Construction of uPVC pipe using open trenching method (Preferred) be considered for approval subject to the following general recommendations:

1. Implementing the EMPr to guide construction and operational activities to provide a framework for the ongoing assessment of environmental performance.
2. Water Use License: The relevant authorisations and water use licenses must be obtained from the Department of Water and Sanitation prior to the commencement of construction activities.
3. No development other than the authorized activities will be allowed within a watercourse or 30m buffer of the watercourse measured from the edge of the watercourse.
4. An independent ECO must be appointed/ designated to ensure that regular inspections are performed during the construction phase and to ensure the implementation of mitigation measures. Furthermore, an ECO must monitor compliance with all the conditions of the EMPr and the environmental authorization once issued.

5. There is continued consultation with relevant stakeholders through an appointed community liaison officer during construction.
6. Reports on the status of construction and legal compliance are submitted to GDARD at stipulated intervals.
7. Clearance of the area should be as minimal as possible and construction activities be confined to areas where construction will take place (development footprint) to prevent negative impacts onto the surrounding environment.
8. Avoid, as far as reasonably possible, disturbing the wetlands. Similarly, restore wetlands that will remain intact if they have been affected by construction activity – this project constitutes rehabilitation activities within a watercourse.
9. Adequate measures must be put in place to prevent polluted runoff water from entering the, wetland and soil, thus preventing surface and groundwater pollution.
10. Servicing/maintenance/washing of vehicles must not be carried on the construction site and only emergency repairs can be done on site.
11. In the event of a major incident (e.g. fire causing damage to property and environment, major spill or leak of contaminants), the relevant authorities should be notified as per the notification of emergencies/incidents, as per the requirements of NEMA.
12. Construction noise on site must not exceed 85 decibels (DB) as stipulated in the Occupation Health and Safety Act.
13. All relevant legislation and requirements of other government departments (National, Provincial), in particular of Section 28 (duty of care) of NEMA, must be complied with.
14. Compliance with all legal requirements in relation to environmental management and conditions of the authorisation issued by GDARD.
15. Maximise the employment of local people and the procurement of local resources during the construction and maintenance phases to ensure maximum benefit to the provincial/local economy.
16. Implement the recommendations made in the specialist studies and EMPr.
17. The EMPr should form part of the contractor's tender documentation.

On completion of the project, the site must be rehabilitated, all litter and construction debris must be removed from the site immediately. All waste must be disposed of at a registered or permitted waste disposal site for the type of waste produced.

From the impact assessment, it is evident that prior to mitigation, impacts associated with the proposed rehabilitation and upgrade are generally moderate. Thus, based on the specialist recommendations, it is the opinion that the project be considered favourably and environmental authorisation granted for the proposed activities, provided the essential and recommended mitigation measures as defined in this report are strictly

adhered to.

9. THE NEEDS AND DESIREBILITY OF THE PROPOSED DEVELOPMENT (as per notice 792 of 2012, or the updated version of this guideline)

The existing AC pipes have either reached or surpassed their useful life span thus Johannesburg Water has decided to replace the AC and clay pipes with a more suitable pipe material as part of their city-wide pipe replacement programme. The primary benefit of the replacement would ensure a reliable water system as well as improve future operational efforts to provide adequate accessibility for maintenance of the system. This would in turn allow for the overall upliftment of the community. The project will also create jobs which will provide an extent of relief to the problem of unemployment being faced within the city.

10. THE PERIOD FOR WHICH THE ENVIRONMENTAL AUTHORISATION IS REQUIRED (*CONSIDER WHEN THE ACITIVITY IS EXPECTED TO BE CONCLUDED*)

Duration and Validity: The environmental authorisation is required for a period of 10 years from the date of issue. Should a longer period be required, the applicant/ EAP will be required to provide a detailed motivation on what the period of validity should be.

11. ENVIRONMENTAL MANAGEMENT PROGRAMME (EMPr) (must include post construction monitoring requirements and when these will be concluded.)

If the EAP answers "Yes" to Point 7 above then an EMPr is to be attached to this report as an Appendix

EMPr attached

YES

SECTION F: APPENDICES

The following appendices must be attached as appropriate (this list is inclusive, but not exhaustive):
It is required that if more than one item is enclosed that a table of contents is included in the appendix

Appendix A: Site plan(s) – *(must include a scaled layout plan of the proposed activities overlain on the site sensitivities indicating areas to be avoided including buffers)*

- A1: Locality Map
- A2: Sensitivity Map
- A3: C-Plan Map
- A4: Hydrology Map
- A5: Wetland Map
- A6: Geology Map
- A7: Soil Map

Appendix B: Photographs

Appendix C: Facility illustration(s)

Appendix D: Route Position Information – N/A

Appendix E: Public participation information

- E1: Proof of Site Notices
- E2: Notification
 - E2 (i): IAP Notification
 - E2 (ii): Organ of State Notification
- E3: Proof of Advertisement
- E4: Correspondence
 - E4(i): IAP Correspondence
 - E4(ii) Organ of State Correspondence
- E5: Meeting Minutes – **N/A at this stage**
- E6: Comments and Response Report
- E7: Comments from I&APs on Basic Assessment (BA) Report – **N/A at this stage**
- E8: Comments from I&APs on amendments to the BA Report – **N/A**
- E9: IAP Database

Appendix F: Water use license(s) authorisation, SAHRA information, service letters from municipalities, water supply information

Appendix G: Specialist Reports

- G1: Wetland/Riparian Delineation and Functional Assessment
- G1(i): General Wetland Rehabilitation and Monitoring Plan
- G2: Terrestrial Fauna Impact Assessment and Management Plan
- G3: Vegetation Assessment
- G4: Heritage Impact Assessment

Appendix H: EMPr

Appendix I: Other information

- I1: EAP Declaration and Expertise
- I2: Specialist Declaration and Expertise

CHECKLIST

To ensure that all information that the Department needs to be able to process this application, please check that:

- Where requested, supporting documentation has been attached;
- All relevant sections of the form have been completed.