FINAL BASIC ASSESSMENT REPORT

THE PROPOSED CONSTRUCTION OF A SECTION OF A WATER PIPELINE TO CONNECT THE BLOEMSPRUIT WWTW TO MOCKES DAM, BLOEMFONTEIN

Applicant: Mangaung Metro Municipality
MDA Ref No: 40673 New
Date: April 2020

mda
Town & Regional Planners,
Environmental & Development
Consultants

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

(For official use only)

File Reference Number:	
Application Number:	
Date Received:	

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

Kindly note that:

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

13. Should a specialist report or report on a specialised process be submitted at any stage for any part of this application, the terms of reference for such report must also be submitted.
14. Two (2) colour hard copies and one (1) electronic copy of the report must be submitted to the competent authority.
15. Shape files (.shp) for maps must be included in the electronic copy of the report submitted to the competent authority.

SECTION A: ACTIVITY INFORMATION

Has a specialist been consulted to assist with the completion of this section?	YES	

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

1. PROJECT DESCRIPTION

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

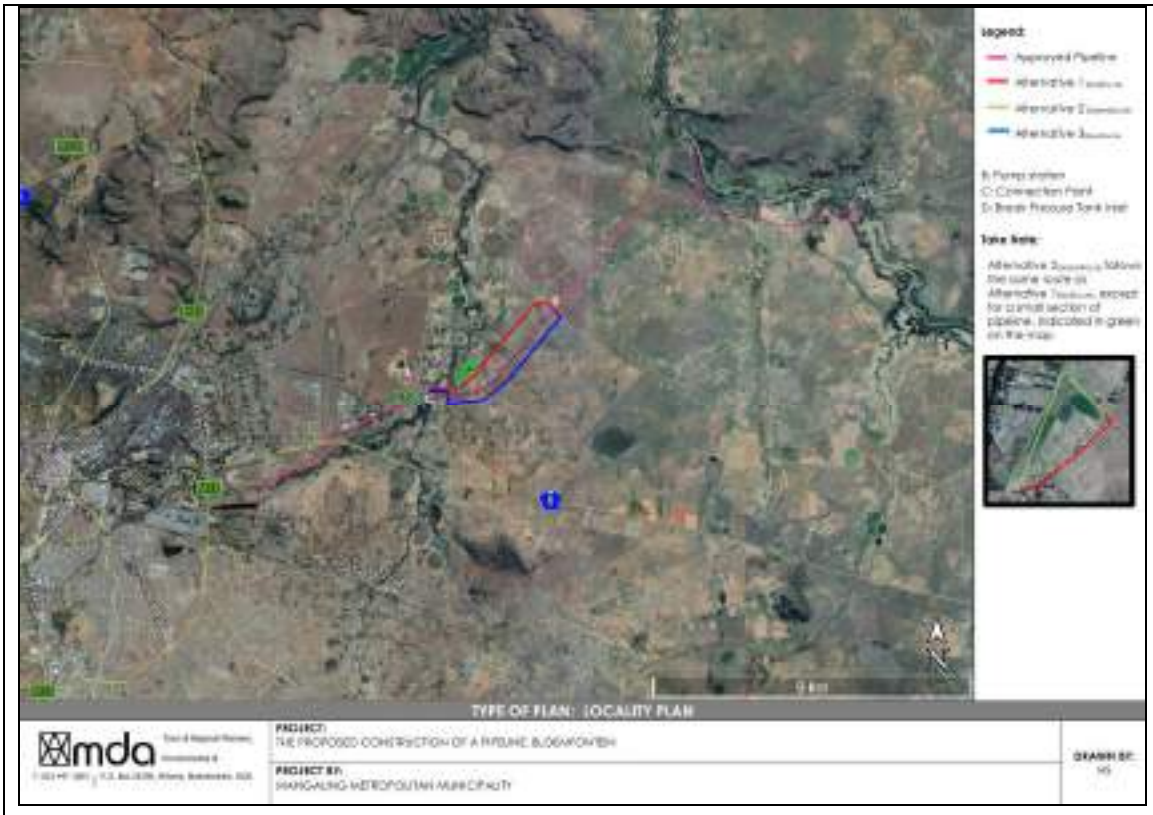
The re-use of water from two of Bloemfontein's largest Waste Water Treatment Works namely Bloemspruit- and North Eastern WWTW were identified as possible sources to supplement the Mangaung Metro Municipality bulk supply scheme. The re-use of water will increase the yield to Maselspoort WTW, with the aim to decrease the need for raw water transfer from the Caledon River via the Novo Transfer Scheme.

As part of the above, water released in Mockes Dam will gravitate to Maselspoort Dam and will be utilised for the purpose of recycling. This form part of the Renosterspruit Water Recycling project by the applicant, i.e. the Manguang Metropolitan Municipality.

The holistic scope of the project includes the design and construction for the transfer of treated effluent from the North Eastern (NE) WWTW and Bloemspruit WWTW to Mockes Dam.

An EA was obtained for the construction of a pipeline from the NE WWTW to Mocke's Dam. The current project entails the re-evaluation of the pipeline route to be followed for a certain section of the approved pipeline.

The proposed ambit for the current project thus includes the design of a new pipeline (from Point C to Point D on map below) to transfer treated effluent from the pump station (see Point B on map below) to the watershed and the proposed new break pressure tank (D). Three pipeline route alternatives are associated with the current project. These alternatives have little to no variance in pipe material cost or size variances.



The proposed section of pipeline from the connection point to the watershed and break pressure tank inlet (Section C to D) should be designed to deliver 77Mℓ/day.

Please refer to Appendix A for more information on the locality of the alternatives to be investigated as part of the current project.

The following scope and project deliverables have been identified as part of the current project:

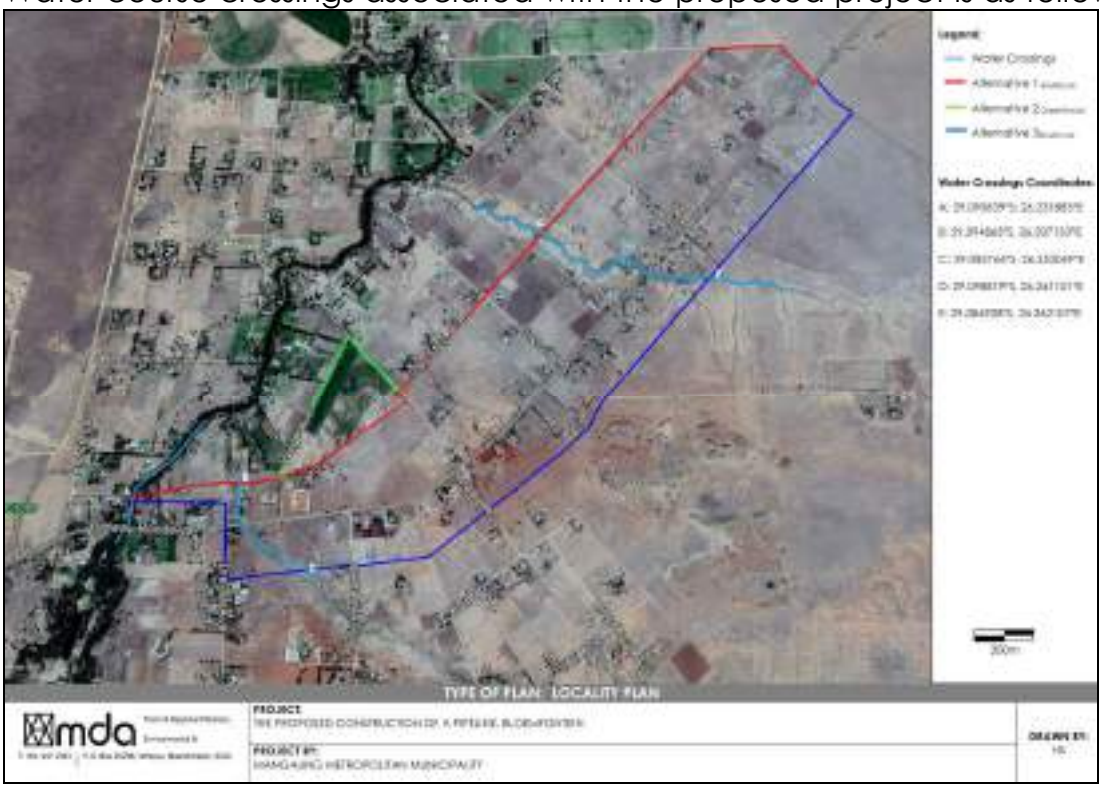
- The design and installation of pipes, valves and HMI's
- The design, supply and installation of SCADA and fibre optic communication network
- The construction of valve-, scour and air-valve chambers and associated pipe works
- Pipe jacking
- Construction of pipeline sections through various water crossings
- Sleeve pipes for the fibre optic cable network
- Construction of a temporary HDPE water reticulation pipeline to residents adjacent to the rising main
- Construction of a new water reticulation with a main diameter of 90 mm to 200mm; and
- Traffic management

- +/- 5km pipeline from the NE WWTW to the Break Pressure Tank Inlet
- Construction of the proposed pipeline through various water crossings
- Fibre Optic Communication
- Width / diameter of the proposed pipeline will be 1.1m. However, the section at the Bloemspruit Crossing will be designed to include the installation of two (2) 800mm Ø steel pipes. There is an existing water main which currently crosses over the bridge and in order to make the exercise of the river crossing more economically feasible it is proposed that this 200mm Ø steel pipe also be included in the design of the river crossing.

A pipeline (glass reinforced pipe) with a diameter of 1.1m will be constructed through the additional water crossings, by taking the methods as stipulated in SABS 1200 DB 1989 into consideration.

The client requested that GRP (Glass Reinforced Pipe) technology be use for low pressure and high flow requirements.

Water course crossings associated with the proposed project is as follows:



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

<table>
<tr><th>Listed activity as described in GN 327,325 and 324</th><th>Description of project activity</th></tr>
<tr><td colspan="2">GN 327, Listing Notice 1:</td></tr>
<tr><td>9(i): The proposed development of infrastructure exceeding 1 000 m in length for the bulk transportation of water or stormwater with an internal diameter of 0.36 m or more
Excluding where
(a) such facilities or infrastructure are for bulk transportation of water, sewage or storm water drainage inside a road reserve or railway reserve; or
(b) where such construction will occur within urban areas but further than 32 m from a watercourse, measured from the edge of the watercourse.</td><td>The proposed pipeline will have an internal diameter of more than 36 cm. Construction of pipelines and infrastructure for the bulk transportation of water within 32 m of a watercourse will also occur.

The proposed diameter of the pipeline is between 800 and 1100 mm.

Coordinates of each of the water crossings associated with the proposed project are as follows:
<table>
<tr><th>Crossing Name</th><th colspan="2">Coordinates</th></tr>
<tr><td>#1 Unnamed stream system (Alternative 3_{BlueRoute})</td><td>S 29.098819°</td><td>E 26.341101°</td></tr>
<tr><td>#2 Unnamed stream system (Alternative 1_{RedRoute &} Alternative 2_{GreenRoute})</td><td>S 29.094865°</td><td>E 26.337133°</td></tr>
<tr><td>#3 Unnamed stream system (Route 1 – Southern Pipeline)</td><td>S 29.084928°</td><td>E 26.362107°</td></tr>
<tr><td>#4 Unnamed stream system (Alternative 1_{RedRoute &} Alternative 2_{GreenRoute})</td><td>S 29.082766°</td><td>E 26.353049°</td></tr>
<tr><td>Large Crossing</td><td>S 29.095839°</td><td>E 26.331883°</td></tr>
</table>
</td></tr>
</table>

<table>
<tr>
<td>9(ii): The proposed development of infrastructure exceeding 1 000 m in length for the bulk transportation of water or stormwater with a peak throughput of 120 litres per second or more
Excluding where
(a) such facilities or infrastructure are for bulk transportation of water, sewage or storm water drainage inside a road reserve or railway reserve; or
(b) where such construction will occur within urban areas but further than 32 m from a watercourse, measured from the edge of the watercourse.</td>
<td>The proposed pipeline will have a peak throughput of more than 120 ℓ/sec. Construction of pipelines and infrastructure for the bulk transportation of water within 32 m of a watercourse will occur.

The peak throughput of the pipeline is estimated at 77Mℓ/day.

Coordinates of each of the water crossings associated with the proposed project are as follows:
<table>
<tr><th>Crossing Name</th><th colspan="2">Coordinates</th></tr>
<tr><td>#1 Unnamed stream system (Alternative $3_{BlueRoute}$)</td><td>S 29.098819°</td><td>E 26.341101°</td></tr>
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<tr><td>Large Crossing</td><td>S 29.095839°</td><td>E 26.331883°</td></tr>
</table>
</td>
</tr>
<tr>
<td>12(ii): The development of infrastructure or structures with a physical footprint of 100 square metres or more, where such</td>
<td>Construction of a pipeline near / through water courses will be undertaken as part of the proposed project.

The width of the servitude / corridor associated with the proposed project is 20m. Construction activities will be limited to the area within the servitude. 5^{+} m</td>
</tr>
</table>

<table>
<tr>
<td>development occurs
(a) Within a watercourse
Excluding
(aa) the development of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour</td>
<td>of length of the water crossings will be impacted upon as part of the proposed project. Thus, the development of infrastructure / structures with a physical footprint of 100+m^2 at various water crossings will be undertaken as part of the proposed project.

Coordinates of each of the water crossings associated with the proposed project are as follows:
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<tr><th>Crossing Name</th><th colspan="2">Coordinates</th></tr>
<tr><td>#1 Unnamed stream system (Alternative $3_{BlueRoute}$)</td><td>S 29.098819°</td><td>E 26.341101°</td></tr>
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</table>
</td>
</tr>
</table>

<table>
<tr>
<td>19: The infilling or depositing of any material of more than 10 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 10 cubic metres from a watercourse.</td>
<td>Pipeline excavations through / near to watercourses will occur. As part of the above process, the infilling and / or depositing of material and / or excavation, removal or moving of material at various watercourses will occur.

Coordinates of each of the water crossings associated with the proposed project are as follows:
<table>
<tr><th>Crossing Name</th><th colspan="2">Coordinates</th></tr>
<tr><td>#1 Unnamed stream system (Alternative $3_{BlueRoute}$)</td><td>S 29.098819°</td><td>E 26.341101°</td></tr>
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</table>
</td>
</tr>
</table>

2. FEASIBLE AND REASONABLE ALTERNATIVES

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

(a) the property on which or location where it is proposed to undertake the activity;
(b) the type of activity to be undertaken;
(c) the design or layout of the activity;

(d) the technology to be used in the activity;
(e) the operational aspects of the activity; and
(f) the option of not implementing the activity.

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

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

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

Background to the proposed project:

Bloemfontein experience water shortages from time to time. This is due to the fact that its main water source, the Welbedacht Dam is silted up, leaving only a small percentage of its original carrying capacity. A major pipeline also reached the end of its design life and bursts regularly.

In addition, water is typically released four times a year from Rustfontein Dam to feed the water need in Bloemfontein. Such water releases usually occurs during the late winter and spring periods, before the onset of the rainy season. These water releases are costly and alternative water resources had to be investigated.

Therefore, Mangaung Metropolitan Municipality has adopted a strategy to utilise local resources to its full potential by re-circulating as much water as possible, instead of transferring water from the Novo Transfer system. Every drop of water that is purified by recirculation will ensure less water to be transferred from the Welbedacht Dam (Caledon River) or possibly the planned Gariep Dam scheme (Caledon and Orange Rivers).

The applicant (i.e Mangaung Metropolitan Municipality) received Environmental Authorisation for the construction of a pipeline from the NE WWTW towards Mocke's Dam. This pipeline will enable the municipality to

transport treated waste water that conforms to the DWS standards from the existing sewage plants to Mockes Dam. From here, the water will flow to Maselspoort Dam and treated at the Maselspoort Water Treatment Works (WTW) to potable water standards, when required. This will ensure that the applicant will have sufficient volumes of water available during the dry season, without the costly water releases from Rustfontein Dam. It should be noted that surplus water released into Mockes Dam will not be treated at the Maselspoort WTW for potable water purposes. Rather, the surplus water will be released into the Modder River, corresponding to the current operating procedures. Note that Maselspoort WTW currently receives bulk water from Mockes Dam that receives water from the Modder River. This river is augmented by continuous effluent from Thaba Nchu and Botshabelo Waste Water Treatment Works (WWTWs). The Modder River flow is also augmented by the Novo Transfer Scheme and is also supported by natural storm water runoff during summer rains. Thus, the proposed project will add to the volume of treated water within the Maselspoort Dam / Modder River.

The current project entails the re-evaluation of the pipeline route to be followed for a certain section of the approved pipeline mentioned above.

Locality:
Please refer to Appendix A for more information on the proposed locality.

Type and Technology:
The latest Type and Technology alternatives will be incorporated as part of the proposed project.

The proposed pipe diameter was optimized by taking into consideration available energy and capital expense in order to utilize the available energy in the pipeline for hydropower generation.

The pipe material, GRP, has the highest resistance to corrosion and with its smooth glass like finish the lowest friction losses resulting in more available energy.

Design and Layout:
Please note that three different layout options are currently considered by the applicant. These options will be discussed throughout this document. The proposed pipeline will be constructed within the existing road reserves, as far as possible. The proposed project will also optimise energy solutions to ensure that less pumping is required. Please refer to Appendix A for more information on the proposed layout.

a) Site alternatives

Alternative $1_{RedRoute}$		
Description	Lat (DDMMSS)	Long (DDMMSS)
Start	29° 5'44.08"S	26°19'52.46"E
Middle	29° 5'4.27"S	26°21'5.00"E
End	29° 4'29.41"S	26°22'6.48"E

Alternative $2_{GreenRoute}$		
Description	Lat (DDMMSS)	Long (DDMMSS)
Start	29° 5'44.08"S	26°19'52.46"E
Middle	29° 5'11.76"S	26°20'57.63"E
End	29° 4'29.41"S	26°22'6.48"E

Alternative $3_{BlueRoute}$		
Description	Lat (DDMMSS)	Long (DDMMSS)
Start	29° 5'44.08"S	26°19'52.46"E
Middle	29° 5'42.91"S	26°21'5.35"E
End	29° 4'29.41"S	26°22'6.48"E

Alternative $1_{RedRoute}$		
Description	Lat (DDMMSS)	Long (DDMMSS)
Coordinates taken every 250m of the pipeline route to be followed. **Note:** Alternative $1_{RedRoute}$ & Alternative $2_{GreenRoute}$ is similar, except for the section indicated in red / green.	29° 5'44.08"S	26°19'52.46"E
	29° 5'43.24"S	26°20'1.45"E
	29° 5'41.97"S	26°20'11.83"E
	29° 5'41.10"S	26°20'22.81"E
	29° 5'36.88"S	26°20'31.06"E
	29° 5'31.40"S	26°20'40.81"E
	29° 5'26.19"S	26°20'43.87"E
	29° 5'19.03"S	26°20'50.30"E
	29° 5'11.76"S	26°20'57.63"E
	29° 5'4.27"S	26°21'5.00"E
	29° 4'56.59"S	26°21'12.00"E
	29° 4'49.54"S	26°21'19.33"E
	29° 4'41.83"S	26°21'26.61"E
	29° 4'34.30"S	26°21'33.61"E
	29° 4'27.10"S	26°21'40.69"E
	29° 4'23.12"S	26°21'50.83"E
	29° 4'23.52"S	26°21'59.69"E
	29° 4'29.41"S	26°22'6.48"E
Alternative $2_{GreenRoute}$		
Description	Lat (DDMMSS)	Long (DDMMSS)
Coordinates taken every 250m of the pipeline route to be followed.	29° 5'44.08"S	26°19'52.46"E
	29° 5'43.24"S	26°20'1.45"E

Note: Alternative $1_{RedRoute}$ & Alternative $2_{GreenRoute}$ is similar, except for the section indicated in red / green.	29° 5'41.97"S	26°20'11.83"E
	29° 5'41.10"S	26°20'22.81"E
	29° 5'33.37"S	26°20'25.35"E
	29° 5'25.21"S	26°20'29.41"E
	29° 5'19.38"S	26°20'35.89"E
	29° 5'26.19"S	26°20'43.87"E
	29° 5'19.03"S	26°20'50.30"E
	29° 5'11.76"S	26°20'57.63"E
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	29° 4'34.30"S	26°21'33.61"E
	29° 4'27.10"S	26°21'40.69"E
	29° 4'23.12"S	26°21'50.83"E
	29° 4'23.52"S	26°21'59.69"E
	29° 4'29.41"S	26°22'6.48"E
Alternative $3_{BlueRoute}$		
Description	Lat (DDMMSS)	Long (DDMMSS)
Coordinates taken every 250m of the pipeline route to be followed.	29° 5'44.08"S	26°19'52.46"E
	29° 5'45.36"S	26°20'1.41"E
	29° 5'45.33"S	26°20'10.30"E
	29° 5'52.79"S	26°20'12.49"E
	29° 5'56.99"S	26°20'18.04"E
	29° 5'55.71"S	26°20'27.21"E
	29° 5'54.95"S	26°20'35.39"E
	29° 5'54.08"S	26°20'43.43"E
	29° 5'52.56"S	26°20'51.75"E
	29° 5'47.84"S	26°20'58.06"E
	29° 5'42.91"S	26°21'5.35"E
	29° 5'38.25"S	26°21'11.76"E
	29° 5'33.09"S	26°21'18.58"E
	29° 5'26.92"S	26°21'23.15"E
	29° 5'21.05"S	26°21'28.89"E
	29° 5'14.46"S	26°21'35.14"E
	29° 5'8.84"S	26°21'40.62"E
	29° 5'2.50"S	26°21'46.65"E
	29° 4'56.39"S	26°21'52.44"E
	29° 4'50.53"S	26°21'58.35"E
	29° 4'44.28"S	26°22'4.24"E
	29° 4'38.13"S	26°22'10.27"E
	29° 4'33.35"S	26°22'9.58"E
	29° 4'29.41"S	26°22'6.48"E

b) Lay-out alternatives

Alternative 1 RedRoute		
Description	Lat (DDMMSS)	Long (DDMMSS)
Please refer to Appendix A for more information on the proposed layout alternatives	29° 5'36.88"S	26°20'31.06"E
Alternative 2 GreenRoute		
Description	Lat (DDMMSS)	Long (DDMMSS)
Please refer to Appendix A for more information on the proposed layout alternatives	29° 5'33.37"S	26°20'25.35"E
Alternative 3 BlueRoute		
Description	Lat (DDMMSS)	Long (DDMMSS)
Please refer to Appendix A for more information on the proposed layout alternatives	29° 5'42.91"S	26°21'5.35"E
Alternative 4OpenTrench		
Description	Lat (DDMMSS)	Long (DDMMSS)
No additional layout alternatives were investigated as part of this application		

c) Technology alternatives

Alternative 1 RedRoute
Construction of a pipeline, please refer to the above sections for more information on the proposed project.
Alternative 2 GreenRoute
Construction of a pipeline, please refer to the above sections for more information on the proposed project.
Alternative 3 BlueRoute
Construction of a pipeline, please refer to the above sections for more information on the proposed project.
Alternative 4 OpenTrench
The alternative method of transporting the water apart from a pipe system is via an open trench. Though the average fall from the water shed is towards Mockes Dam, there are several stream crossings that would intercept the water. This makes an open channel design impractical as aqueducts would require mayor civil structures and land acquisition or alternatively the route need to be increase to move upstream of these river crossing. With the above in mind, it is evident that this alternative is not reasonable and / or feasible. Therefore, the preferred alternatives (construction of pipelines), as discussed in the above section, is seen as the preferred alternative. This alternative (construction of an open trench) will not be discussed further in this document.

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

N/A

e) No-go alternative

The no-go alternative is not seen as a reasonable / feasible alternative as this will place the Mangaung Metropolitan Municipality in such a position that it will not be able to provide Bloemfontein with recycled water, resulting in a possible water shortage and water restrictions on a regular basis. The proposed pipeline and associated infrastructure is considered essential to enable the Mangaung Metropolitan Municipality to provide the Bloemfontein area with adequate basic services, as the proposed project entails the transportation of treated waste water, to be recycled at the Maselspoort WTW. As the project is described as a basic service, the lack thereof will lead to major social and economic impacts that will indirectly cause severe environmental concerns. The impacts expected during the construction phase of the proposed project can be minimised through the recommended mitigation measures and therefore the no-go alternative is not ideal.

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

3. PHYSICAL SIZE OF THE ACTIVITY

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

or, for linear activities:

Alternative:	Length of the activity:
Alternative 1 RedRoute	4 860 m
Alternative 2 GreenRoute	5 180 m
Alternative 3 BlueRoute	5 460 m

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

Alternative:	Size of the site/servitude:
Alternative 1 RedRoute	97 200 m^2
Alternative 2 GreenRoute	103 600 m^2

Alternative 3 BlueRoute	109 200 m²

***NOTE: if a servitude of 10 m on each side is taken into consideration**

4. SITE ACCESS

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

Describe the type of access road planned:

Existing asphalt and dirt roads will be used to gain access to the sites, as far as possible.

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

5. LOCALITY MAP

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

- an accurate indication of the project site position as well as the positions of the alternative sites, if any;
- indication of all the alternatives identified;
- closest town(s;)
- road access from all major roads in the area;
- road names or numbers of all major roads as well as the roads that provide access to the site(s);
- all roads within a 1km radius of the site or alternative sites; and
- a north arrow;
- a legend; and
- locality GPS co-ordinates (Indicate the position of the activity using the latitude and longitude of the centre point of the site for each alternative site. The co-ordinates should be in degrees and decimal minutes. The minutes should have at least three decimals to ensure adequate accuracy. The projection that must be used in all cases is the WGS84 spheroid in a national or local projection.

6. LAYOUT/ROUTE PLAN

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

The site or route plans must indicate the following:

- the property boundaries and numbers of all the properties within 50 metres of the site;
- the current land use as well as the land use zoning of the site;

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

7. SENSITIVITY MAP

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

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

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

8. SITE PHOTOGRAPHS

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

9. FACILITY ILLUSTRATION

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

10. ACTIVITY MOTIVATION

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

1. Is the activity permitted in terms of the property's existing land use rights?	YES		
The pipeline sections will be constructed within road reserves, where possible. Servitudes will be registered for areas not part of the existing road reserve.			

2. Will the activity be in line with the following?			
(a) Provincial Spatial Development Framework (PSDF)		NO	
The activity will not have a negative effect on the on the PSDF. The local municipality (i.e. the applicant) strives to provide residents in the area with good service in general. The proposed pipeline sections should be constructed in order to provide basic services to residents in the Bloemfontein area.			
(b) Urban edge / Edge of Built environment for the area	YES		
The proposed pipeline will be constructed within existing road reserves where possible (within the already built environment of the area). New servitudes will be registered for the sections that do not form part of existing road reserves / servitudes.			
(c) Integrated Development Plan (IDP) and Spatial Development Framework (SDF) of the Local Municipality (e.g. would the approval of this application compromise the integrity of the existing approved and credible municipal IDP and SDF?).	YES		
The proposed project is in line with the vision of the said local municipality. The applicant (Mangaung Metropolitan Municipality) strives to provide residents in the area with good service in general. The proposed infrastructure should be constructed in order to provide basic services to the residents.			
(d) Approved Structure Plan of the Municipality	YES		
The proposed project is in line with the municipal plans.			
(e) An Environmental Management Framework (EMF) adopted by the Department (e.g. Would the approval of this application compromise the integrity of the existing environmental management priorities for the area and if so, can it be justified in terms of sustainability considerations?)	YES		
The proposed project will not compromise the integrity of the existing environmental management priorities for the area. Please note that the applicant will ensure that the contractors adhere to the conditions stipulated in this report, the EMPr as well as best practices to limit any possible negative impacts on the environment.			
(f) Any other Plans (e.g. Guide Plan)	YES		
N/A			

3. Is the land use (associated with the activity being applied for) considered within the timeframe intended by the existing approved SDF agreed to by the relevant environmental authority (i.e. is the proposed development in line with the projects and programmes identified as priorities within the credible IDP)?	YES		
The applicant (Mangaung Metropolitan Municipality) strives to provide residents in the area with good service in general. The proposed infrastructure should be constructed in order to provide basic services to the residents.			
4. Does the community/area need the activity and the associated land use concerned (is it a societal priority)? (This refers to the strategic as well as local level (e.g. development is a national priority, but within a specific local context it could be inappropriate.)	YES		
A need was identified to construct a water pipeline in order to connect the Bloemspruit WWTW to Mockes Dam, Bloemfontein. This is required to enable municipal goals of service delivery and protect the environment in the long run.			
5. Are the necessary services with adequate capacity currently available (at the time of application), or must additional capacity be created to cater for the development? (Confirmation by the relevant Municipality in this regard must be attached to the final Basic Assessment Report as Appendix I.)		NO	
Wastewater will be treated at the New North Eastern WWTW (adequate capacity). Bloemspruit WWTW may be upgraded in future to produce the required quality of wastewater.			
6. Is this development provided for in the infrastructure planning of the municipality, and if not what will the implication be on the infrastructure planning of the municipality (priority and placement of services and opportunity costs)? (Comment by the relevant Municipality in this regard must be attached to the final Basic Assessment Report as Appendix I.)	YES		
The applicant for the proposed pipeline is the Mangaung Metropolitan Municipality itself. The proposed project is provided for in the infrastructure planning of the municipality. Please refer to Appendix I for more information.			

7. Is this project part of a national programme to address an issue of national concern or importance?	YES		
The proposed project entails the construction of pipeline sections in order put the local municipality in such a position to provide residents in the area with basic services. Providing of basic services is part of a national programme.			
8. Do location factors favour this land use (associated with the activity applied for) at this place? (This relates to the contextualisation of the proposed land use on this site within its broader context.)	YES		
The proposed pipeline sections will be constructed within road reserves as far as possible. In addition, the proposed pipelines should be constructed in locations that require the necessary basic service. Thus, the location factors favour the proposed construction activities.			
9. Is the development the best practicable environmental option for this land/site?	YES		
As an alternative, servitudes can be registered on agricultural land. However, this will imply that more natural vegetation will be lost, as the vegetation in the road reserves (preferred alternatives) was already disturbed during the construction of the road. In addition, more alien / exotic plant species is found within the road reserves than within the agricultural areas. The above option will thus have a larger impact on the environment and will financially be more costly, and therefore it is not seen as a feasible / reasonable alternative. The proposed project is therefore the best practicable environmental option for this land/site.			

10. Will the benefits of the proposed land use/development outweigh the negative impacts of it?	YES		

Negative impacts:

- Previous disturbed areas will be disturbed during the construction phase.
- Erosion may occur during the construction phase.
- Possible pollution may occur during the construction phase.

Positive impacts:

- The proposed project is considered essential to enable the municipality to provide basic services to residents in the area.
- This in turn will have a positive impact on the social as well as economic impacts of the area.

The negative impacts expected during the construction phase of the proposed project can be minimised through the recommended mitigation measures as stipulated in this report, the EMPr as well as best practices.

11. Will the proposed land use/development set a precedent for similar activities in the area (local municipality)?	YES		

It is suggested that future water pipeline projects will also consider the construction of water pipelines within existing road reserves as far as possible as this have the minimal impacts to the environment. This is due to the following:

- The construction of access roads are not required
- Loss of vegetation is kept to a minimum
- No loss of agricultural land
- Most economical alternative as owners of agricultural property do not have to be compensated for the registration of servitudes on their agricultural property

12. Will any person's rights be negatively affected by the proposed activity/ies?		NO	
The residents of Bloemfontein will be positively affected as the proposed pipelines will provide the municipality with the opportunity to provide basic services to the area. The pipeline will be constructed within servitudes and therefore no person's rights will be negatively affected.			
13. Will the proposed activity/ies compromise the "urban edge" as defined by the local municipality?		NO	
It is not anticipated that the proposed activity itself will have an effect on the 'urban edge'.			
14. Will the proposed activity/ies contribute to any of the 17 Strategic Integrated Projects (SIPS)?	YES		
SIP 6 can be summarised as follows: Integrated municipal infrastructure project • The development of the national capacity to assist the 23 least resourced districts (accommodating 19 million people) to address all the maintenance backlogs and upgrades required in water, electricity and sanitation bulk infrastructure. • The road maintenance programme will enhance service delivery capacity thereby impacting positively on the population. Therefore, the proposed project (construction of pipelines for water provision) contributes to SIP 6.			
15. What will the benefits be to society in general and to the local communities?			
As the project is described as a basic service entity, the lack thereof will lead to major social impacts that will indirectly cause severe environmental concerns. Benefits: Potable water, treated to DWS Standards, will be provided to Bloemfontein Residents.			

16. Any other need and desirability considerations related to the proposed activity?	
The proposed project will enable the municipality to provide basic services (potable water) to the Bloemfontein residents. The pipeline is required to transport treated effluent from the existing WWTWs to the Maselspoort WTW in order to recycle the water.	
17. How does the project fit into the National Development Plan for 2030?	
The proposed project will enable the municipality to provide basic services (potable water) to the Bloemfontein residents. The pipeline is required to transport treated effluent from the existing WWTWs to the Maselspoort WTW in order to recycle the water. This will have a positive impact on the socio-economics of the area.	

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

Section 23 of NEMA (Act 107, 27 November 1998) reads as follows:

(1) The purpose of this Chapter is to promote the application of appropriate environmental management tools in order to ensure the integrated environmental management of activities.

(2) The general objective of integrated environmental management is to -

(a) promote the integration of the principles of environmental management set out in section 2 into the making of all decisions which may have a significant effect on the environment;

(b) identify, predict and evaluate the actual and potential impact on the environment, socio-economic conditions and cultural heritage, the risks and consequences and alternatives and options for mitigation of activities, with a view to minimizing negative impacts, maximizing benefits and promoting compliance with the principles of environmental management set out in section 2;

(c) ensure that the effects of activities on the environment receive adequate consideration before actions are taken in connection with them;

(d) ensure adequate and appropriate opportunity for public participation in decisions that may affect the environment;

(e) ensure the consideration of environmental attributes in management and decision-making which may have a significant effect on the environment; and

(f) identify and employ the modes of environmental management best suited to ensuring that a particular activity is pursued in accordance with the principles of environmental management set out in section 2.

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

With the above in mind, the following objectives were taken into consideration:

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

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

Section 2 of NEMA (Act 107, 27 November 1998) is summarised as follows:

(1) The principles set out in this section apply throughout the Republic to the actions of all organs of state that may significantly affect the environment and—
   (a) shall apply alongside all other appropriate and relevant considerations, including the State's responsibility to respect, protect, promote and fulfil the social and economic rights in Chapter 2 of the Constitution and in particular the basic needs of categories of persons disadvantaged by unfair discrimination;
   (b) serve as the general framework within which environmental management and implementation plans must be formulated:
   (c) serve as guidelines by reference to which any organ of state must exercise any function when taking any decision in terms of this Act or any statutory provision concerning the protection of the environment;
   (d) serve as principles by reference to which a conciliator appointed under this Act must make recommendations; and
   (e) guide the interpretation, administration and implementation of this Act, and any other law concerned with the protection or management of the environment.

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

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

(4)*(a)* Sustainable development requires the consideration of all relevant factors including the following:
   (i) that the disturbance of ecosystems and loss of biological diversity are avoided, or, where they cannot be altogether avoided, are minimised and remedied;
   (ii) taking into account the limits of current knowledge about the consequences of decisions and actions; and
   (iii) that negative impacts on the environment and on people's environmental rights be anticipated and prevented, and where they cannot be altogether prevented, are minimised and remedied;
   (iv) that pollution and degradation of the environment are avoided, or, where they cannot be altogether avoided, are minimised and remedied;

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

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

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

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

(ix) that a risk-averse and cautious approach is applied.

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

(4)(c) Environmental justice must be pursued so that adverse environmental impacts shall not be distributed in such a manner as to unfairly discriminate against any person, particularly vulnerable and disadvantaged persons.

(4)(d) Equitable access to environmental resources, benefits and services to meet basic human needs and ensure human well-being must be pursued and special measures may be taken to ensure access thereto by categories of persons disadvantaged by unfair discrimination.

(4)(e) Responsibility for the environmental health and safety consequences of a policy, programme, project, product, process, service or activity exists throughout its life cycle.

(4)(f) The participation of all interested and affected parties in environmental governance must be promoted, and all people must have the opportunity to develop the understanding, skills and capacity necessary for achieving equitable and effective participation, and participation by vulnerable and disadvantaged persons must be ensured.

(4)(g) Decisions must take into account the interest, needs and values of all the interested and affected parties, and this includes recognizing all forms of knowledge, including traditional and ordinary knowledge.

(4)(h) Community wellbeing and empowerment must be promoted through environmental education, the raising of environmental awareness, the sharing of knowledge and experience and other appropriate means.

(4)(i) The social, economic and environmental impacts of activities, including disadvantages and benefits must be considered, assessed and evaluated and decisions must be appropriate in the light of such consideration and assessment.

(4)(j) The right of workers to refuse work that is harmful to human health or the environment and to be informed of dangers must be respected and protected.

(4) (k) Decisions must be taken in an open and transparent manner, and access to information must be provided in accordance with the law.

(4)(l) There must be intergovernmental co-ordination and harmonisation of policies, legislation and actions relating to the environment.

(4)(m) Actual or potential conflicts of interest between organs of state should be resolved through conflict resolution procedures.

(4)(n) Global and international responsibilities relating to the environment must be discharged in the national interest.

(4)(o) The environment is held in public trust for the people. The beneficial use of environmental resources must serve the public interest and the environment must be protected as the people's common heritage.

(4)(p) The costs of remedying pollution, environmental degradation and consequent adverse health effects and of preventing, controlling or minimising further pollution, environmental damage or adverse health effects must be paid for by those responsible for harming the environment.

(4)(q) The vital role of women and youth in environment management and development must be recognised and their full participation therein must be promoted.

(4)(r) Sensitive, vulnerable, highly dynamic or stressed ecosystems, such as coastal shores, estuaries, wetlands and similar systems require specific attention in management and planning procedures, especially where they are subject to significant human resource usage and development pressure.

With the above in mind, the applicant of the proposed project took the following into consideration:

1. That the disturbance of ecosystems and loss of biological diversity are minimised and remedied by implementing the mitigation measures in this document, the EMPr as well as best practices.
2. Environmental management must be integrated.
3. Adverse environmental impacts (if any) shall not be distributed in such a manner as to unfairly discriminate against any person, particularly vulnerable and disadvantaged persons.
4. The participation of all interested and affected parties in environmental governance must be promoted by means of the public participation process that forms part of the basic assessment process.

5. Community wellbeing and empowerment must be promoted by providing employment opportunities during the construction as well as operational phase, where applicable.
6. The right of workers to refuse work that is harmful to human health or the environment and to be informed of dangers will be respected and protected.

11. APPLICABLE LEGISLATION, POLICIES AND/OR GUIDELINES

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

Title of legislation, policy or guideline	Applicability to the project	Administering authority	Date
National Environmental Management Act, 1998 (Act 107 of 1998)	Proposed development near a watercourse	DESTEA	1998
National Water Act, 1998 (Act 36 of 1998)	Proposed development near a watercourse	DWS	1998
National Heritage Resources Act (Act No 25 of 1999)	Proposed development near a watercourse	SAHRA	1999
Environmental Conservation Act (Act 73 of 1989)	Proposed development near a watercourse	DESTEA	1989
National Environmental Management Biodiversity Act, 2004 (Act 10 of 2004)	Endangered / Vulnerable vegetation types and Protected Species (TOPS)	DEA / DESTEA	2004
National Heritage Resources Act (Act No 25 of 1999)	Proposed construction of a pipeline	SAHRA	1999
National Forests Act (Act No. 84 of 1998) (NFA)	Conservation of protected trees (if any)	DAFF	1998
National Veld and Forest Fires Act, Act 101 of 1998 (NVFFA)	Mitigation measures to be implemented in case of a fire	DAFF	1998
NEM Laws Amendment Act Department (Act 25 of 2014)	Amended regulations for the Public Participation Process.	DEA / DESTEA	2014

Conservation of Agricultural Resources Act (Act 43 of 1983)	Agricultural land traversed by the pipeline (if any). Alien vegetation in and surrounding site.	DAFF	1983
National Water Act, 1998 (Act 36 of 1998)	Activities in proximity to 32m from watercourses.	DWS	1998

12. WASTE, EFFLUENT, EMISSION AND NOISE MANAGEMENT

a) Solid waste management

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

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

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

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

Authorised solid waste disposal sites in Bloemfontein. Hazardous waste (if any) should be disposed of at an authorized hazardous landfill site such as Holfontein.

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

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

N/A

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

N/A

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

N/A

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

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

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

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

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

b) Liquid effluent

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

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

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

If YES, provide the particulars of the facility:

NOTE: Although the proposed project will not produce any effluent to be treated on / off site, the proposed activities will, during its operational phase, transport **treated** waste water to Mockes Dam. The transported water may be treated to potable water quality at Maselspoort WTW.

Facility name:	Mockes Dam		
Contact person:	Victor Mapeshoane		
Postal address:	Mangaung Metropolitan Municipality P.O. Box 3704 Bloemfontein		
Postal code:	9300		
Telephone:		**Cell:**	083 662 3395
E-mail:	victor.mapeshoane@mangaung.co.za	**Fax:**	

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

The applicant (Mangaung Metropolitan Municipality) strives to provide residents in the area with good service in general. The proposed pipeline should be constructed in order to provide basic services as well as potable water to the residents and community members in general as it will imply that treated water will be available for further treatment (to potable water quality) at the Maselspoort WTW.

c) Emissions into the atmosphere

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

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

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

NOTE: The emissions associated with the project during the construction phase will mostly be exhaust emission and dust. Dust will be controlled during the construction phase, when necessary. The vehicles travelling to and from the proposed site will contribute to the emissions released into the atmosphere during the operational phase of the proposed project. However, these emissions are not controlled by any legislation.

d) Waste permit

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

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

e) Generation of noise

Will the activity generate noise?	YES
If YES, is it controlled by any legislation of any sphere of government?	NO

Describe the noise in terms of type and level:

Nuisance noise may be generated during the construction period. However, the significance thereof will be low and limited to areas under construction.

In addition, blasting activities may also contribute to the generation of noise in the area, during the construction phase. The soil types in the area are classified as mostly soft with less than 10% of excavation classified as hard and therefore it is not anticipated that blasting activities will occur. However, in the event that blasting is required, these activities may contribute to the generation of noise. The required PPE will be worn by construction workers, during any blasting event. In addition, the contractors should comply with the relevant legislation in this regard.

13. WATER USE

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

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

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

NOTE:
The required application [Section 21 (c) & (i)] will be submitted by the applicant in due course.

14. ENERGY EFFICIENCY

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

The pipeline will be designed in such a manner that the water in the pipeline will move by means of gravity, as far as possible, to minimise the requirement of pump stations, thus minimising energy usage.

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

N/A

SECTION B: SITE/AREA/PROPERTY DESCRIPTION

Important notes:

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

Section B Copy No. (e.g. A): ☐

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

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

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

Property description/physical address:	Please refer to list attached, as part of **Appendix A**.

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

Current land-use zoning as per local municipality IDP/records:	Mostly within the existing road reserve. Alternatively, agriculture (farms).

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

Please refer to Appendix A for a list of current land-use zonings.

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

1. GRADIENT OF THE SITE

Indicate the general gradient of the site.

Alternative 1 RedRoute:

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**

Alternative 2 GreenRoute:

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**

Alternative 3 BlueRoute:

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**

NOTE:
Most of the pipeline route has a general gradient of 1:50-1:20. Certain sections near waterways have a gradient steeper than 1:5.

2. LOCATION IN LANDSCAPE

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

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

3. GROUNDWATER, SOIL AND GEOLOGICAL STABILITY OF THE SITE

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

	Preferred Alternative 1, 2 and 3
Shallow water table (less than 1.5m deep)	NO
Dolomite, sinkhole or doline areas	NO
Seasonally wet soils (often close to water bodies)	YES (at waterways)
Unstable rocky slopes or steep slopes with loose soil	NO
Dispersive soils (soils that dissolve in water)	NO
Soils with high clay content (clay fraction more than 40%)	NO
Any other unstable soil or geological feature	NO
An area sensitive to erosion	YES (at waterways)

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

4. GROUNDCOVER

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

Natural veld -	**Natural veld**	Natural veld with	Veld dominated	Gardens

good condition[E]	**with scattered aliens[E]**	heavy alien infestation[E]	by alien species[E]	
Sport field	Cultivated land	Paved surface	Building or other structure	Bare soil

NOTE: Summary of Ecological Reports:

The proposed pipeline that will be constructed from the Renoster Spruit, will pass through the Roodewal Small Holdings, and will join the tarred road at the north eastern border of the small holdings. The pipeline will form part of the main water provision for the city and as such will function as transport for treated waste water to the purification plant at the Maselspoort Dam and from there back to Bloemfontein for re-use. The pipeline will cross peri-urban, transformed and natural areas, several watercourses will also be crossed by the pipeline. The assessment will include the assessment of alternative pipeline routes that have an estimated length of 5 km each.

Large Crossing:

The Renosterspruit contain dense thicket and reed beds. The said spruit is considered to have a PES of Category F: Critically/Extremely modified. Modifications have reached a critical level and the system has been modified completely with an almost complete loss of natural habitat and biota. In the worst instances the basic ecosystem functions have been destroyed and the changes are irreversible. In spite of this seriously modified nature the stream still provide a vital ecosystem service as water conduits and must therefore still be considered sensitive. Several impacts on the stream have caused this modified condition. The stream is naturally only seasonal. However, due to canalisation and runoff from urban areas and industry it can now be seen as a non-natural perennial system. This has had a profound impact on riparian vegetation and the flood dynamics of the stream. The stream flow through urban and industrial areas which contribute highly polluted runoff. This leads to high levels of pollution within the streams. A large portion of the Bloemspruit has been canalised. This has a large impact on the functioning of the stream in terms of flood dynamics and the ecosystem services rendered by an intact riparian community. The Bloemspruit flows past the Bloemfontein WWTW which does not have sufficient capacity and consequently untreated sewage overflows into the stream further leading to high levels of pollution and degradation of the stream. High levels of rubbish dumping takes place within the catchment and in stream and this further degrades these streams. The Bloemspruit feeds into the Renosterspruit and consequently the degraded condition both impact on each other.

Alternative 1$_{RedRoute}$ & Alternative 2$_{GreenRoute}$

The vegetation along the northern pipeline route has mostly been transformed from the natural condition with only a few remnant patches of natural vegetation remaining and these also not in a good condition. The vegetation along the route is therefore no longer considered to consist of the threatened Bloemfontein Dry Grassland. This alternative pipeline route should therefore result in a significantly lower impact than the southern alterative. However, there is still a low likelihood of protected species occurring along the patches of remnant natural vegetation and a walkthrough survey of at least these sections should be undertaken to identify and mark protected species. Should any protected species be identified which will be affected by the pipeline construction they should be removed and transplanted adjacent to the pipeline in an area of suitable and similar habitat. Permits must be obtained for those specimens to be transplanted.

Alternative 3$_{BlueRoute}$

The southern pipeline route alternative contains sections which has been modified and transformed significantly from the natural condition and these portions are consequently of relatively low conservation value. However, several large portions of relatively natural vegetation still remain, especially in the eastern section of the pipeline. Consisting of Bloemfontein Dry Grassland, a Threatened Ecosystem, and highly likely containing protected species, these sections should be regarded as sensitive and having a significant conservation value. The condition of the vegetation in these sections does however seem to be somewhat degraded along the border fences which should decrease the impact the proposed pipeline will have. Adequate mitigation will however be required which should include minimising the disturbance footprint and conducting a walkthrough survey to identify and mark protected species along the pipeline route. It is recommended that any protected plant specimens which will be affected by the pipeline construction should be removed and transplanted adjacent to the pipeline in an area of suitable and similar habitat. Permits must be obtained for those specimens to be transplanted.

All the assessed pipeline routes cross the same two small seasonal stream systems and these will be the subject of this study.

From the description of the riparian vegetation of both stream systems it is clear that obligate wetland vegetation is present along both and therefore clearly indicate the presence of wetland conditions. These are more pronounced along the eastern stream, a much larger system. Exotic vegetation indicate varying degrees of disturbance at all points of crossing

although in both instances the crossings along the northern pipeline route is indicative of more disturbances than the crossings along the southern pipeline route.

The small seasonal stream systems which will be affected by the pipeline is still natural to some extent but has been significantly modified by several impacts which is mostly associated with the surrounding small holding land uses and infrastructure such as roads. An Index of Habitat Integrity (IHI) was conducted and indicated that the watercourses have an Instream IHI of Category C: Moderately Modified and Riparian IHI of Category C/D: Moderately to Largely Modified.

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

The proposed pipeline will result in several significant impacts on these watercourses. The material being transported by the pipeline being treated water will have a negligible impact should leaks or spillages occur into watercourses. This is therefore not considered a likely impact. The installation of the pipeline will however result in the disturbance of the bed and banks of the watercourses. This in turn will promote erosion, prevent the banks from stabilising and lead to increased sedimentation of the watercourses. As a result disturbance of the banks should be kept to a minimum and erosion remediated where it occurs. Removal of vegetation should also be kept to a minimum. It is further recommended that the aboveground installation of the pipeline on pylons at crossings be done as far as possible as this will cause fewer disturbances. The disturbance caused by construction will also cause susceptible conditions for further establishment of exotics. It is therefore recommended that weed eradication be initiated at the crossing sites prior to construction and continued until rehabilitation of the pipeline route has been completed. When excavating in watercourses the upper 30 cm, or topsoil, should be removed together with the vegetation and stored as sods on the site. These should then be replaced on top of the installed pipeline. Subsoil should be used as backfilling and not as top dressing. Only removed sods and topsoil should be utilised to rehabilitate the bed and bank surface. The soil surface should also be re-instated to the virgin soil level and not depressed or elevated as this will promote erosion and cause flow barriers. After rehabilitation any excess soil or material should be removed and disposed of at a registered disposal facility. Installation of the pipeline through the watercourses should preferably be undertaken during the winter months (July to September) when base flow will be at its lowest level.

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

5. SURFACE WATER

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

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

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

Please refer to Appendix A for an indication of all the water crossings associated with the proposed project.

NOTE: The Renoster Spruit is naturally a non-perennial stream. However, due to various man-made activities, water is being released into the Renoster Spruit and therefore water may be flowing down the spruit on a more regular (or even permanent) basis.

6. LAND USE CHARACTER OF SURROUNDING AREA

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

Natural area	**Dam or reservoir**	Polo fields
Low density residential	Hospital/medical centre	Filling station [H]
Medium density residential	School	Landfill or waste treatment site
High density residential	Tertiary education facility	Plantation
Informal residential[A]	Church	**Agriculture**
Retail commercial & warehousing	Old age home	**River, stream or wetland**
Light industrial	Sewage treatment plant[A]	Nature conservation area
Medium industrial [AN]	Train station or shunting yard [N]	Mountain, koppie or ridge
Heavy industrial [AN]	Railway line [N]	Museum
Power station	Major road (4 lanes or more) [N]	Historical building
Office/consulting room	Airport [N]	Protected Area
Military or police	Harbour	Graveyard

base/station/compound		
Spoil heap or slimes dam[A]	Sport facilities	**Archaeological site**
Quarry, sand or borrow pit	Golf course	Other land uses (describe)

NOTE:
The primary option for the construction of a pipeline near the Road Bridge at the Renoster Spruit is trenching through the water crossing. An alternative is the construction of a pipe bridge, or to attach the pipeline to the existing bridge. Approval from SAHRA is required should the attachment of the pipeline to the existing bridge be considered.

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

N/A

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

N/A

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

N/A

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

Critical Biodiversity Area (as per provincial conservation plan)		NO
Core area of a protected area?		NO
Buffer area of a protected area?		NO
Planned expansion area of an existing protected area?		NO
Existing offset area associated with a previous Environmental Authorisation?	YES (The current project entails the re-evaluation of the pipeline route for a section of an already approved pipeline.	

	Please refer to Appendix A for more information)	
Buffer area of the SKA?		NO

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

NOTE:
Although the area itself is not classified as a protected area as per any provincial conservation plan etc., the area near to the watercourses is seen as areas worth protecting.

Please refer to Appendix A for an indication on the position of the approved pipeline route (with a previous Environmental Authorisation) in relation to the current proposed pipeline route alternatives.

7. CULTURAL/HISTORICAL FEATURES

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

Summary of Phase 1 Heritage Impact Report:

A Phase 1 Heritage Impact Assessment was carried out for three proposed water pipeline alternatives along Roodewal Midway Road between the Renosterspruit and Blesbok Avenue in Bloemfontein, Free State Province. The proposed pipeline will function as transport for treated water to the purification plant at the Maselspoort Dam and from there back to Bloemfontein for re-use. As far as the palaeontological heritage is concerned, likelihood of palaeontological impact resulting from these linear developments is considered low for each of the three alternative routes as a result of the low topography terrain and presence of a well-developed, superficial overburden. Development for any of the three alternatives can proceed provided that all excavation activities are solely restricted to the current layout. However, any excavation exceeding depths of >1m into freshly exposed sedimentary strata (Adelaide Subgroup bedrock sediments) will require brief monitoring by a qualified palaeontologist so that any chance fossil finds can be retrieved and reported to SAHRA for further verification and mitigation. As far as the archaeological heritage is concerned, the proposed development is considered to be of low archaeological significance and is assigned a site rating of Generally Protected C. Development for any of the three alternatives can proceed with no further archaeological assessments required.

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

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

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

NOTE: Should it be necessary to attach the pipeline onto existing bridge infrastructures, an application will be submitted to SAHRA and the Heritage Coordinator in Bloemfontein for approval

8. SOCIO-ECONOMIC CHARACTER

a) Local Municipality

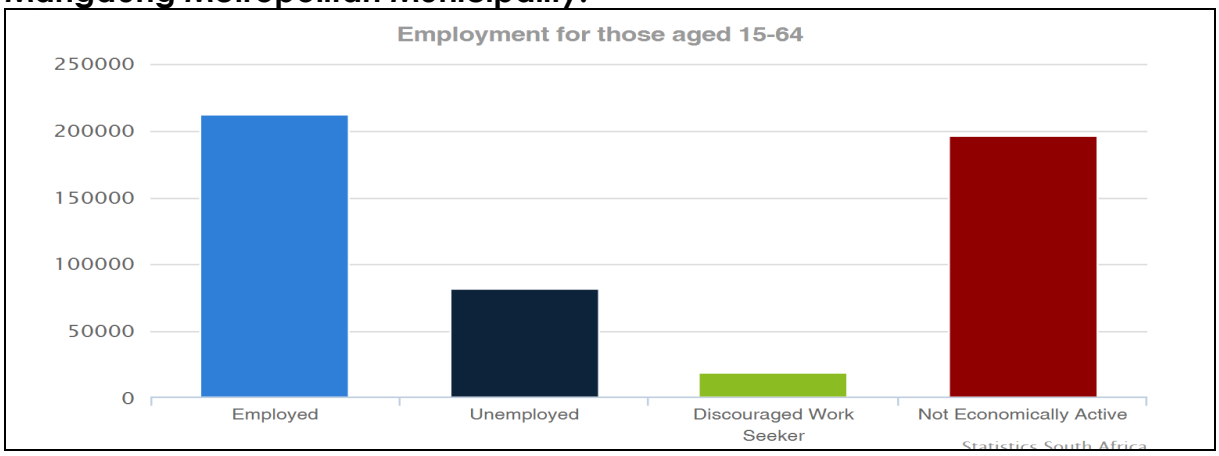
Please provide details on the socio-economic character of the local municipality in which the proposed site(s) are situated.

NOTE:

The information in this section was obtained from the following web addresses:
http://www.statssa.gov.za/?page_id=1021&id=mangaung-municipality
&
https://wazimap.co.za

Level of unemployment:

Mangaung Metropolitan Municipality:



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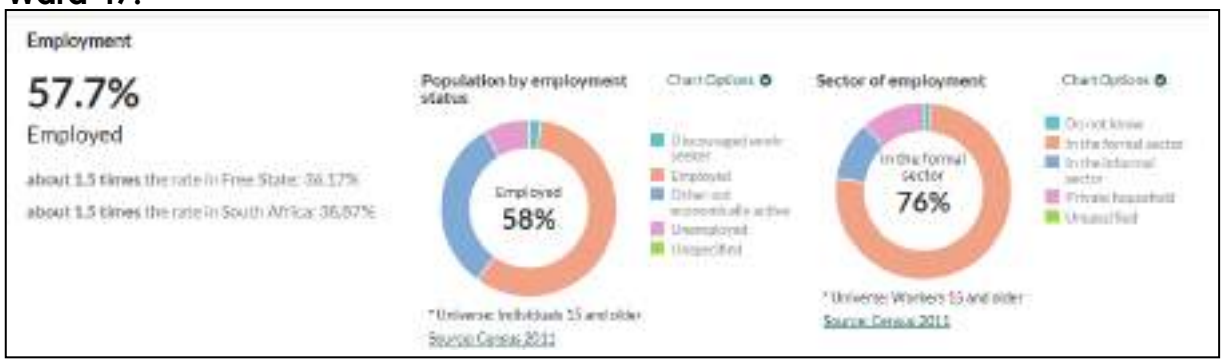
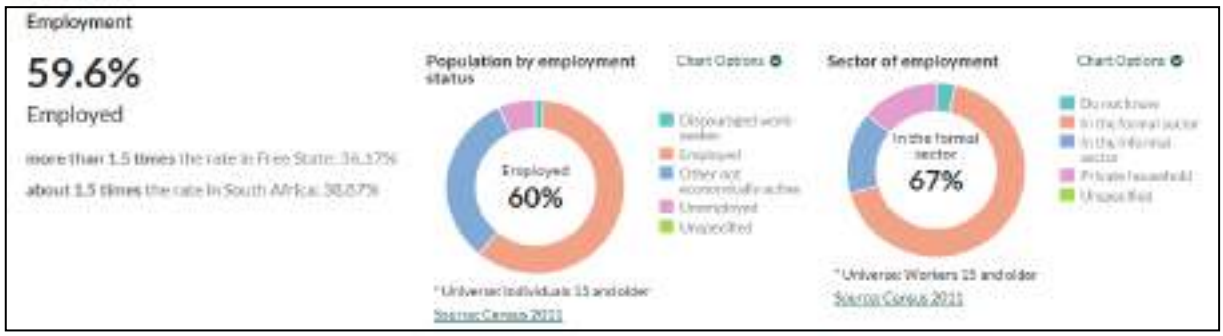


Ward 44:



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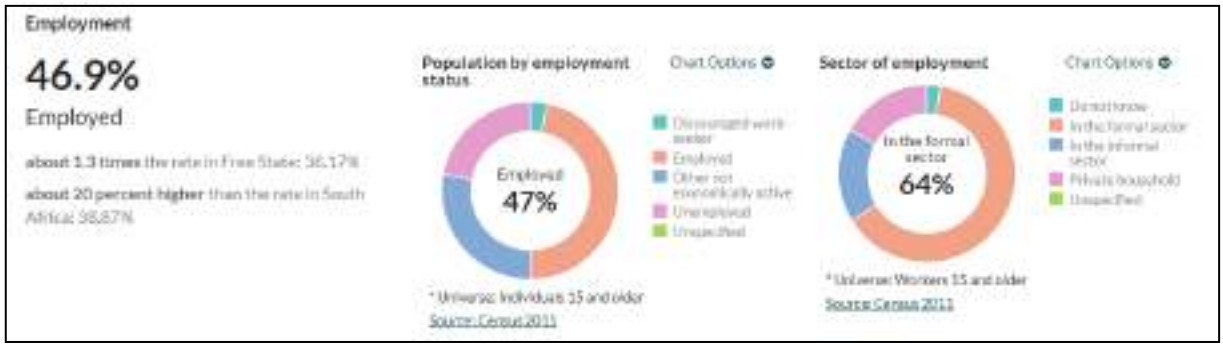
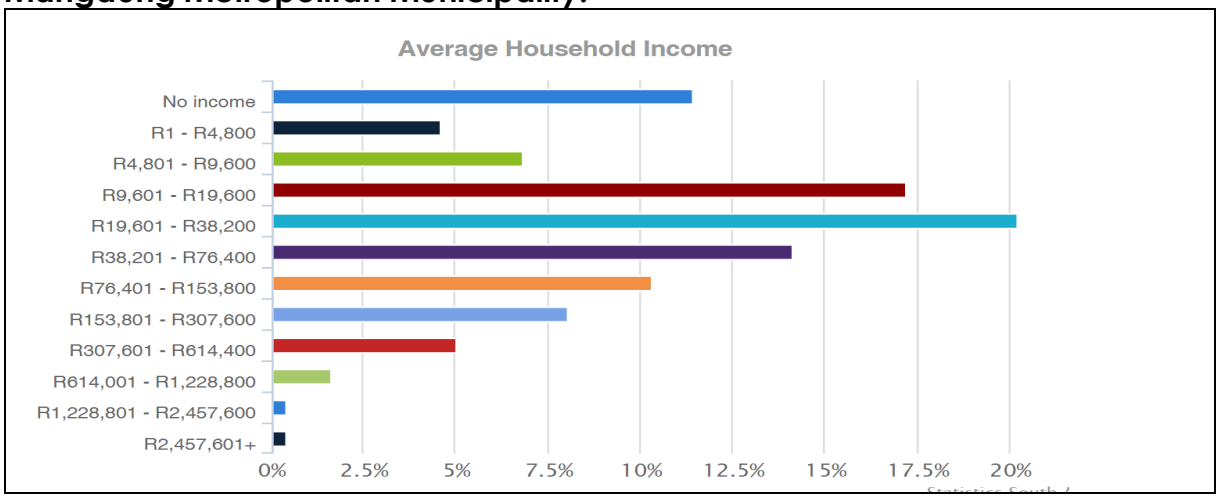


Economic profile of local municipality:

Mangaung Metropolitan Municipality:



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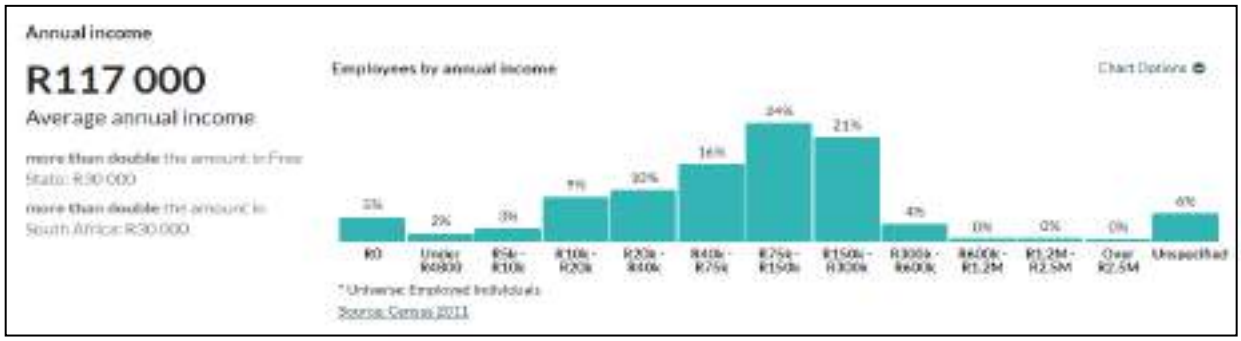

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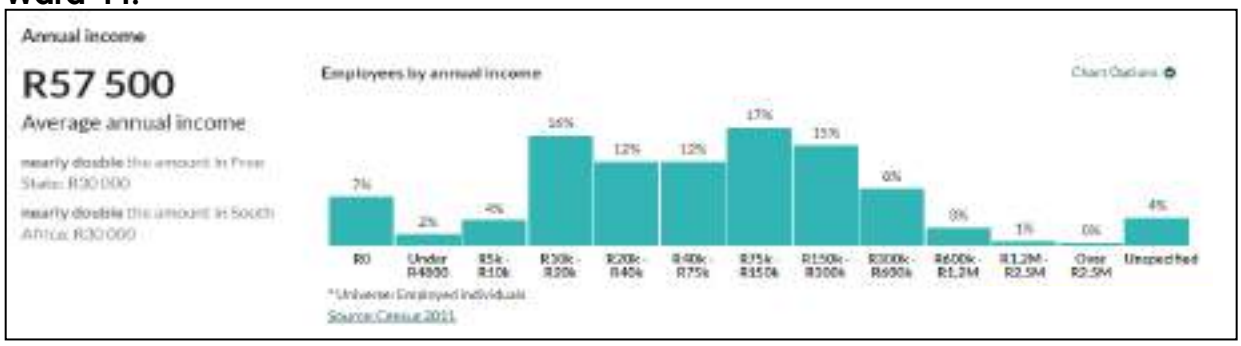

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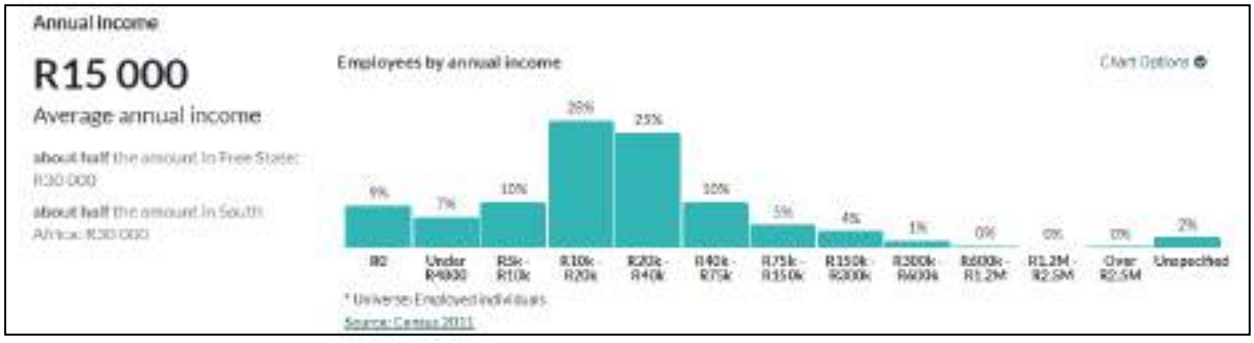
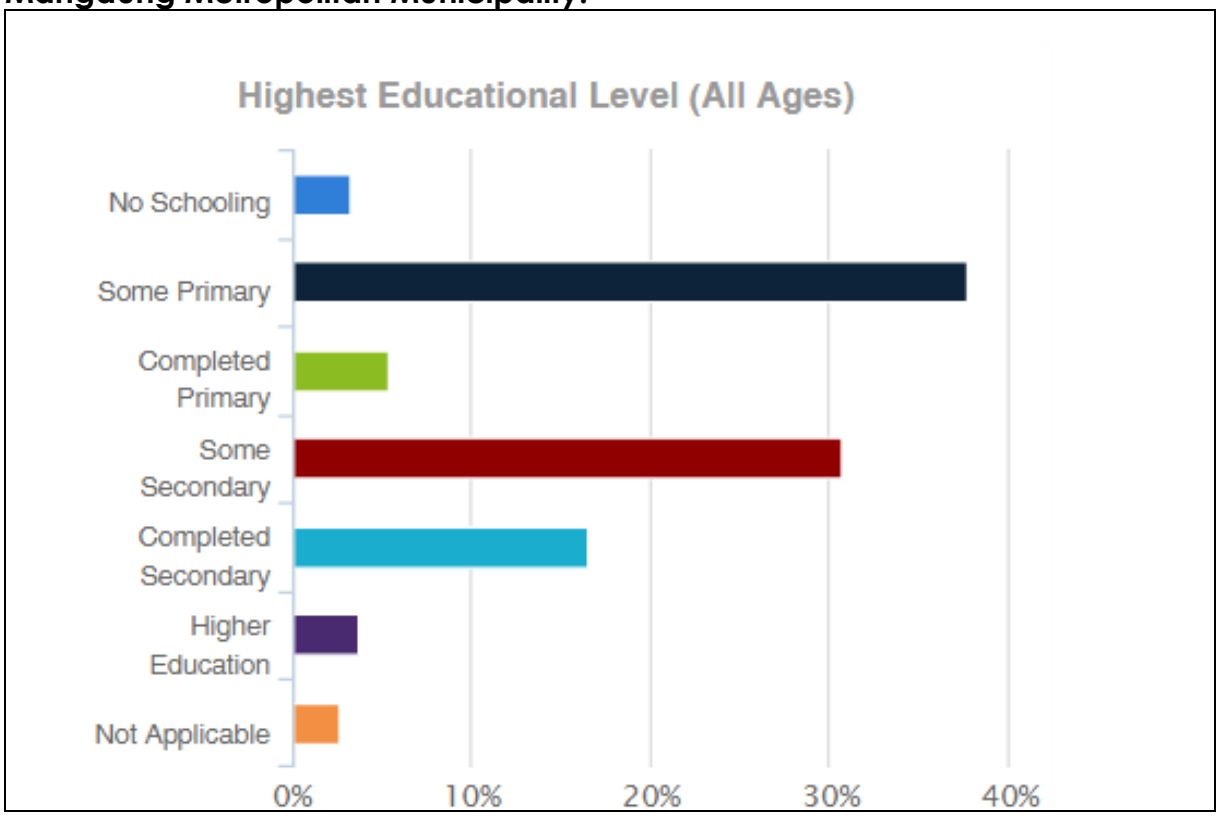


Level of education:

Mangaung Metropolitan Municipality:



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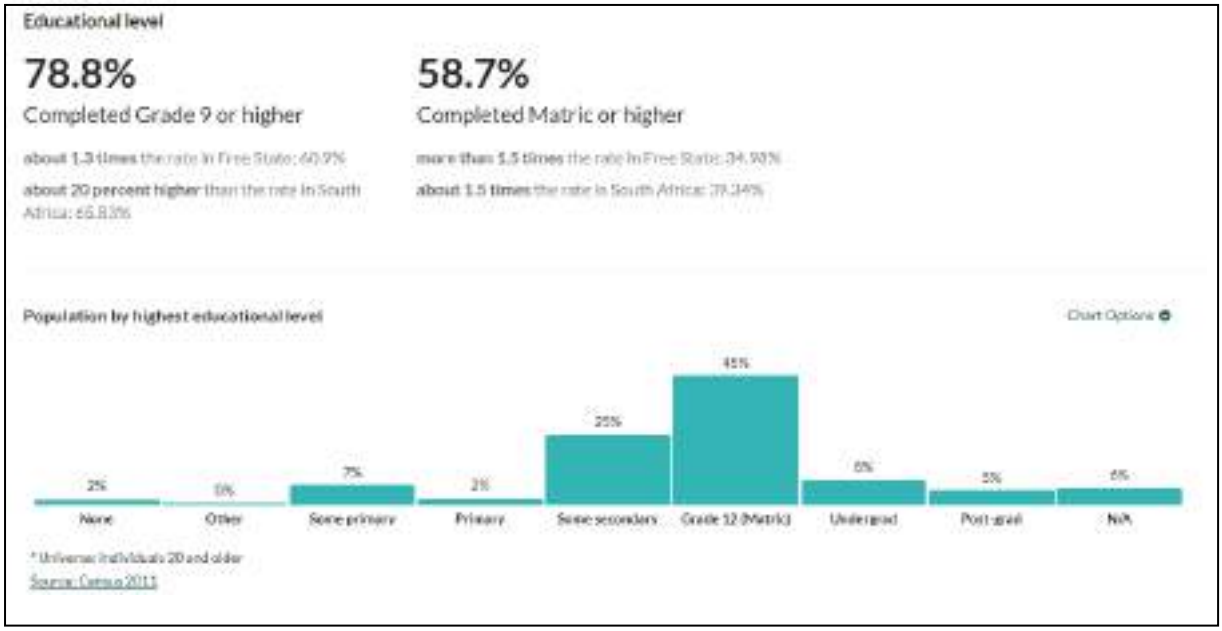

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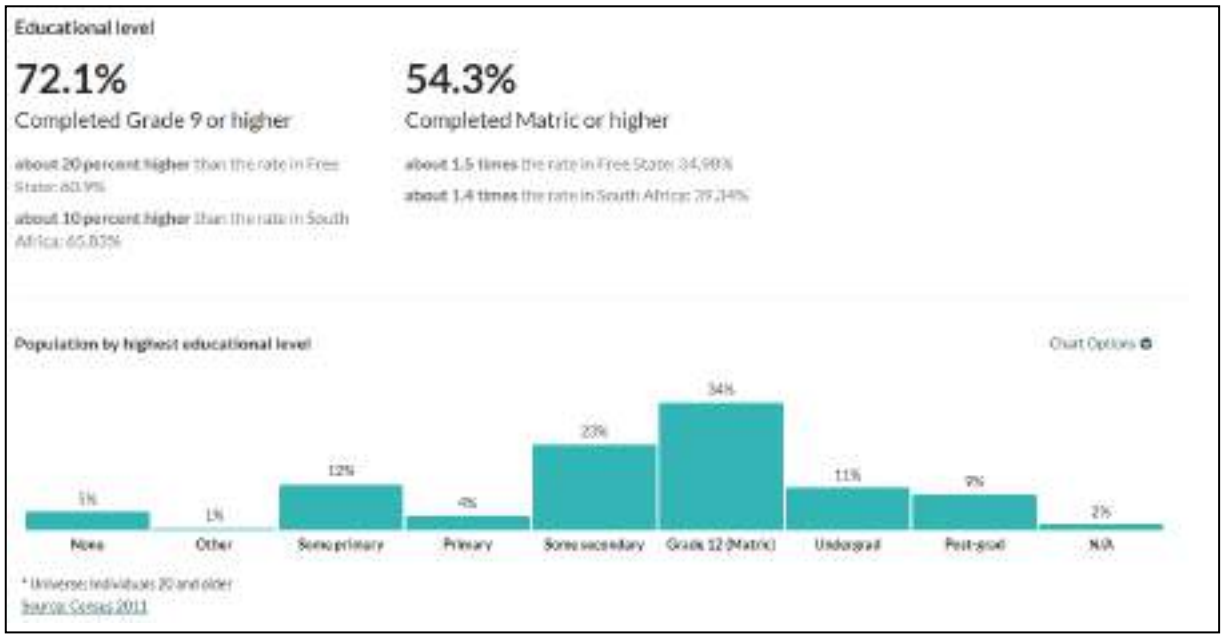
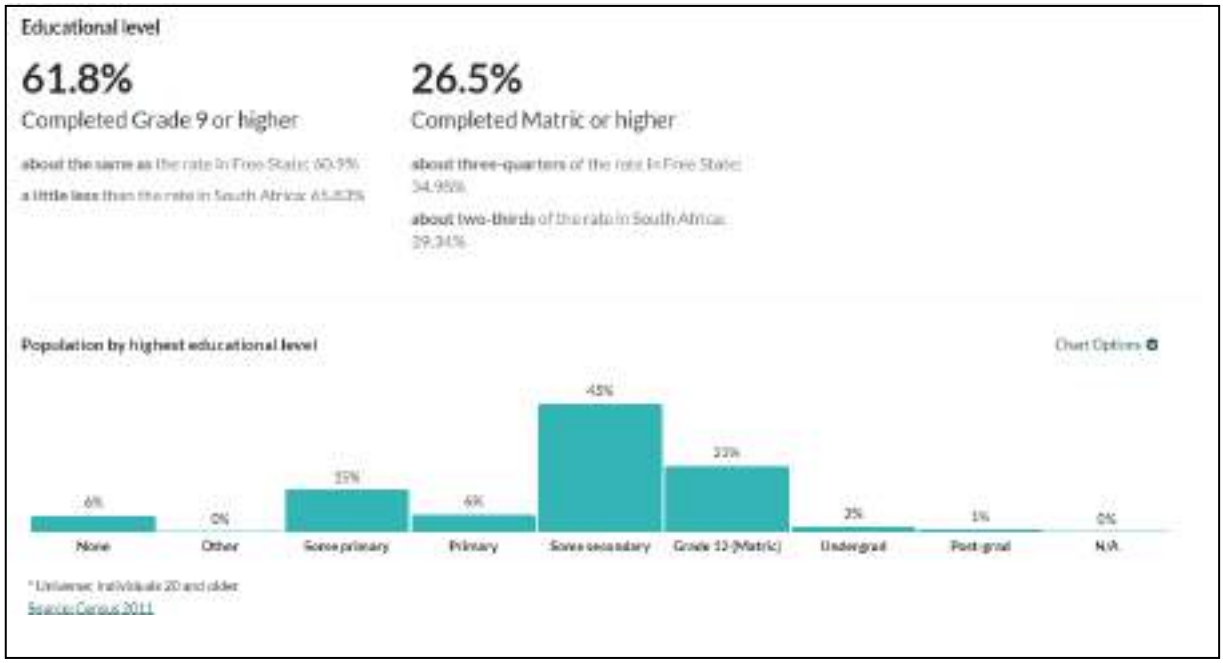


Ward 17:



b) Socio-economic value of the activity

What is the expected capital value of the activity on completion?	R 102 000 000	
What is the expected yearly income that will be generated by or as a result of the activity?	Unknown. The proposed project is a service delivery project.	
Will the activity contribute to service infrastructure?	YES	
Is the activity a public amenity?	YES	
How many new employment opportunities will be created in the development and construction phase of the activity/ies?	Approximately 30 000 man-days	
What is the expected value of the employment opportunities during the development and construction phase?	Approximately R6 000 000	
What percentage of this will accrue to previously disadvantaged individuals?	Approximately 80%	
How many permanent new employment opportunities will be created during the operational phase of the activity?	Unknown	
What is the expected current value of the employment opportunities during the first 10 years?	Unknown	
What percentage of this will accrue to previously disadvantaged individuals?	Approximately 80%	

9. BIODIVERSITY

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

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

Systematic Biodiversity Planning Category				If CBA or ESA, indicate the reason(s) for its selection in biodiversity plan
Critical Biodiversity Area (CBA)	Ecological Support Area (ESA)	**Other Natural Area (ONA)**	No Natural Area Remaining (NNR)	**Large Crossing:** The Renosterspruit contain dense thicket and reed beds. The said spruit is considered to have a PES of Category F: Critically/Extremely modified. Modifications have reached a critical level and the system has been modified completely with an almost complete loss of natural habitat and biota. In the worst instances the basic ecosystem functions have been destroyed and the changes are irreversible. In spite of this seriously modified nature the stream still provide a vital ecosystem service as water conduits and must therefore still be considered sensitive. Several impacts on the stream have caused this modified condition. The stream is naturally only seasonal. However, due to canalisation and runoff from urban areas and industry it can now be seen as a non-natural perennial system. This has had a profound impact on riparian vegetation and the flood dynamics of the stream. The stream flow through urban and industrial areas which contribute highly polluted runoff. This leads to high levels of pollution within the streams. A large portion of the Bloemspruit has been canalised. This has a large impact on the functioning of the stream in terms of flood dynamics and the ecosystem services rendered by an intact riparian community. The Bloemspruit flows past the Bloemfontein WWTW which does not have sufficient capacity and consequently untreated sewage overflows into the stream further leading to high levels of pollution and degradation of the stream. High levels of rubbish dumping takes place within the catchment and in stream and this further degrades these streams. The Bloemspruit feeds into the Renosterspruit and consequently the degraded condition both impact on each other.

Systematic Biodiversity Planning Category				If CBA or ESA, indicate the reason(s) for its selection in biodiversity plan
Critical Biodiversity Area (CBA)	Ecological Support Area (ESA)	**Other Natural Area (ONA)**	No Natural Area Remaining (NNR)	**Alternative 1$_{RedRoute}$ & Alternative 2$_{GreenRoute}$:** The vegetation along the northern pipeline route has mostly been transformed from the natural condition with only a few remnant patches of natural vegetation remaining and these also not in a good condition. The vegetation along the route is therefore no longer considered to consist of the threatened Bloemfontein Dry Grassland. This alternative pipeline route should therefore result in a significantly lower impact than the southern alterative. However, there is still a low likelihood of protected species occurring along the patches of remnant natural vegetation and a walkthrough survey of at least these sections should be undertaken to identify and mark protected species. Should any protected species be identified which will be affected by the pipeline construction they should be removed and transplanted adjacent to the pipeline in an area of suitable and similar habitat. Permits must be obtained for those specimens to be transplanted.

Systematic Biodiversity Planning Category				If CBA or ESA, indicate the reason(s) for its selection in biodiversity plan
Critical Biodiversity Area (CBA)	Ecological Support Area (ESA)	**Other Natural Area (ONA)**	No Natural Area Remaining (NNR)	**Alternative 3$_{BlueRoute}$:** The southern pipeline route alternative contains sections which has been modified and transformed significantly from the natural condition and these portions are consequently of relatively low conservation value. However, several large portions of relatively natural vegetation still remain, especially in the eastern section of the pipeline. Consisting of Bloemfontein Dry Grassland, a Threatened Ecosystem, and highly likely containing protected species, these sections should be regarded as sensitive and having a significant conservation value. The condition of the vegetation in these sections does however seem to be somewhat degraded along the border fences which should decrease the impact the proposed pipeline will have. Adequate mitigation will however be required which should include minimising the disturbance footprint and conducting a walkthrough survey to identify and mark protected species along the pipeline route. It is recommended that any protected plant specimens which will be affected by the pipeline construction should be removed and transplanted adjacent to the pipeline in an area of suitable and similar habitat. Permits must be obtained for those specimens to be transplanted.

b) Indicate and describe the habitat condition on site

Habitat Condition	Percentage of habitat condition class (adding up to 100%)	Description and additional Comments and Observations (including additional insight into condition, e.g. poor land management practises, presence of quarries, grazing, harvesting regimes etc).
Natural	10%	Refer to the section below
Near Natural (includes areas with low to moderate level of alien invasive plants)	10%	
Degraded (includes areas heavily invaded by alien plants)	40%	
Transformed (includes cultivation, dams, urban, plantation, roads, etc)	40%	

Large Crossing:

The Renosterspruit contain dense thicket and reed beds. The said spruit is considered to have a PES of Category F: Critically/Extremely modified. Modifications have reached a critical level and the system has been modified completely with an almost complete loss of natural habitat and biota. In the worst instances the basic ecosystem functions have been destroyed and the changes are irreversible. In spite of this seriously modified nature the stream still provide a vital ecosystem service as water conduits and must therefore still be considered sensitive. Several impacts on the stream have caused this modified condition. The stream is naturally only seasonal. However, due to canalisation and runoff from urban areas and industry it can now be seen as a non-natural perennial system. This has had a profound impact on riparian vegetation and the flood dynamics of the stream. The stream flow through urban and industrial areas which contribute highly polluted runoff. This leads to high levels of pollution within the streams. A large portion of the Bloemspruit has been canalised. This has a large impact on the functioning of the stream in terms of flood dynamics and the ecosystem services rendered by an intact riparian community. The

Bloemspruit flows past the Bloemfontein WWTW which does not have sufficient capacity and consequently untreated sewage overflows into the stream further leading to high levels of pollution and degradation of the stream. High levels of rubbish dumping takes place within the catchment and in stream and this further degrades these streams. The Bloemspruit feeds into the Renosterspruit and consequently the degraded condition both impact on each other.

Alternative 1$_{RedRoute}$ & Alternative 2$_{GreenRoute}$:
The northern route is dominated by undulating terrain with most of the natural vegetation having been transformed previously or in a quite degraded condition. Remnant patches of natural vegetation are present but overall not in a good condition. The route will be situated to the north of the tarred Maselspoort road and will also be mostly situated adjacent to an existing gravel road. This also further decreases the condition of the vegetation along the route. This pipeline route also contains a small alternative deviation but will be discussed as a whole as it does not contain any elements different from the rest of the pipeline route.

The pipeline route is situated in its entirety in the Roodewal Small Holdings and does not border on any significant natural areas. The survey indicated that small remnants of the natural grassland are present but evidently not in a good condition. The remainder of the pipeline route has been degraded to such an extent as not being good representative samples of the natural vegetation type. The small holdings entail intensive stock farming, crop cultivation and general disturbance associated with small-scale farming activities. Spatial data also confirms that the natural vegetation type, Bloemfontein Dry Grassland, is considered transformed along this pipeline route.

The following description of the terrestrial vegetation along this pipeline route should also give a good indication of the condition it is in. Naturally this area should consist of Bloemfontein Dry Grassland, a vegetation type characterised by a dominant grass layer, often dominated by the climax grass, *Themeda triandra*, but also a prominent dwarf shrub component with a diversity of geophytic species. This has however been altered along the majority of the pipeline route. The grass layer has been much diminished and dwarf karroid shrubs are dominant in many areas. Dominant dwarf shrubs include *Lycium horridum, Pentzia incana, Rosenia humilis, Felicia muricata, Hertia pallens, Salsola rabieana* and *Chrysocoma* ciliata. A few pioneer herbaceous species has also become prominent with *Nidorella resedifolia*, forming dominant patches in some areas. Other prominent herbaceous species also include *Senecio consanguineus* and *Osteospermum scariosum*. The small geophyte, *Moraea pallida*, is abundant. This species is unpalatable and even poisonous to stock and proliferates where overgrazing occurs as

along the pipeline route. Overgrazing and disturbance of the grass layer has also resulted in the increased establishment of shrubs and trees, especially the tree, *Vachellia karroo*, and shrub, *Asparagus larcinus*. A few exotic weeds have also established due to the degraded condition and include *Datura ferox* and *Opuntia humifusa*. The latter also being serious invasive and forms extensive clumps in this area. As mentioned, the natural grass layer is much diminished. However, the climax grass, *Themeda triandra* is still present in a few areas where remnants of the natural vegetation remain. Where a grass layer is still present these are often dominated by pioneer species such as *Chloris virgata, Eragrostis lehmanniana, Tragus koelerioides, Cynodon dactylon* and *Aristida congesta*.

In conclusion, the vegetation along the northern pipeline route has mostly been transformed from the natural condition with only a few remnant patches of natural vegetation remaining and these also not in a good condition. The vegetation along the route is therefore no longer considered to consist of the threatened Bloemfontein Dry Grassland. This alternative pipeline route should therefore result in a significantly lower impact than the southern alternative. However, there is still a low likelihood of protected species occurring along the patches of remnant natural vegetation and a walkthrough survey of at least these sections should be undertaken to identify and mark protected species. Should any protected species be identified which will be affected by the pipeline construction they should be removed and transplanted adjacent to the pipeline in an area of suitable and similar habitat. Permits must be obtained for those specimens to be transplanted.

Alternative $3_{BlueRoute}$:
The southern route is dominated by undulating terrain with a substantially higher degree of remaining natural vegetation present. The route will cross the tarred Maselspoort road and will mostly avoid roads, being situated along the border of small holdings. Several large natural areas occur to the south of the pipeline route.

The western portion of this route is located within the small holdings and although portions of natural vegetation remain they have been degraded to such an extent as not being good representative samples of the natural vegetation type. The small holdings entail intensive stock farming, crop cultivation and general disturbance associated with small-scale farming activities. The eastern portion of this route also contains extensive disturbance but also large areas of comparative natural grassland. Here the pipeline route exits the small holdings and is bordered to the south by extensive natural areas but to the north by small holdings. A large historical borrow pit is situated along the pipeline route and is therefore a transformed portion. The eastern portion bordering the pipeline route to the south is however still

largely natural and is confirmed by available spatial data indicating it is still forming part of the Bloemfontein Dry Grassland, a Threatened Ecosystem.
The following description of the terrestrial vegetation along this pipeline route should also give a good indication of the condition it is in. Naturally this area should consist of Bloemfontein Dry Grassland, a vegetation type characterised by a dominant grass layer, often dominated by the climax grass, *Themeda triandra*, but also a prominent dwarf shrub component with a diversity of geophytic species. The western portion of this pipeline route situated in the small holdings has however been altered to a significant extent. The grass layer has been much diminished and dwarf karroid shrubs are dominant in many areas. Dominant dwarf shrubs include *Lycium horridum, Pentzia incana, Rosenia humilis, Felicia muricata* and *Chrysocoma* ciliata. Where a grass layer is still present these are often dominated by pioneer species such as *Chloris virgata, Eragrostis lehmanniana* and *Aristida congesta*. However, there are still areas containing patches of climax *Themeda triandra*, which indicates that remnants of the natural vegetation type is still present and it is highly likely that protected species of conservation value will still be present here.

As mentioned the eastern section of this pipeline route is situated in an area consisting of natural vegetation. Access to this section could however not be provided and only limited sampling was undertaken here. From this sampling the following assumptions could be made. The area consists of a dominant grass layer with the climax grass, *Themeda triandra* dominating and thus indicating that the vegetation is still largely natural. Patches of dwarf karroid shrubs are still present but not prominent and therefore further substantiate that the vegetation is still largely natural. A few geophytic species were also observed, including *Eriospermum porphyrium* and *Colchicum longipes*. It is therefore also highly likely that protected species may occur along this section. It was however also noted that the border between the small holdings and natural areas to the south contained significant levels of disturbance most likely as a result of the edge effect often present along borders between degraded and natural areas. The impact that the pipeline will have should therefore be limited as long as the disturbance footprint is kept to a minimum and confined to the small strip along the border fence. As a result of disturbance several pioneer herbaceous species are prominent along the border and include *Salvia verbenaca, Senecio consanguineus, Arctotis arctotheca, Chenopodium album* as well as the exotic weed, *Alternanthera pungens*. An old borrow pit also occurs in the eastern section of the pipeline route which is consequently associated with significant transformation of the natural vegetation. Here dolerite outcrops are also abundant and as a result several tree species have also established here including *Vachellia karroo, Searsia lancea* as well as an exotic invasive tree, *Melia azedarach*.

In conclusion, the southern pipeline route alternative contains sections which has been modified and transformed significantly from the natural condition and these portions are consequently of relatively low conservation value. However, several large portions of relatively natural vegetation still remain, especially in the eastern section of the pipeline. Consisting of Bloemfontein Dry Grassland, a Threatened Ecosystem, and highly likely containing protected species, these sections should be regarded as sensitive and having a significant conservation value. The condition of the vegetation in these sections does however seem to be somewhat degraded along the border fences which should decrease the impact the proposed pipeline will have. Adequate mitigation will however be required which should include minimising the disturbance footprint and conducting a walkthrough survey to identify and mark protected species along the pipeline route. It is recommended that any protected plant specimens which will be affected by the pipeline construction should be removed and transplanting adjacent to the pipeline in an area of suitable and similar habitat. Permits must be obtained for those specimens to be transplanted.

c) Complete the table to indicate:

(i) the type of vegetation, including its ecosystem status, present on the site; and

(ii) whether an aquatic ecosystem is present on site.

Terrestrial Ecosystems		**Aquatic Ecosystems**						
Ecosystem threat status as per the National Environmental Management: Biodiversity Act (Act No. 10 of 2004)	Least Threatened	Wetland (including rivers, depressions, channelled and unchanneled wetlands, flats, seeps pans, and artificial wetlands)			Estuary		Coastline	
		YES (water resource)				NO		NO

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

Large Crossing:
The Renosterspruit contain dense thicket and reed beds. The said spruit is considered to have a PES of Category F: Critically/Extremely modified. Modifications have reached a critical level and the system has been modified completely with an almost complete loss of natural habitat and biota. In the worst instances the basic ecosystem functions have been destroyed and the changes are irreversible. In spite of this seriously modified nature the stream still provide a vital ecosystem service as water conduits and must therefore still be considered sensitive. Several impacts on the stream have caused this modified condition. The stream is naturally only seasonal. However, due to canalisation and runoff from urban areas and industry it can now be seen as a non-natural perennial system. This has had a profound impact on riparian vegetation and the flood dynamics of the stream. The stream flow through urban and industrial areas which contribute highly polluted runoff. This leads to high levels of pollution within the streams. A large portion of the Bloemspruit has been canalised. This has a large impact on the functioning of the stream in terms of flood dynamics and the ecosystem services rendered by an intact riparian community. The Bloemspruit flows past the Bloemfontein WWTW which does not have sufficient capacity and consequently untreated sewage overflows into the stream further leading to high levels of pollution and degradation of the stream. High levels of rubbish dumping takes place within the catchment and in stream and this further degrades these streams. The Bloemspruit feeds into the Renosterspruit and consequently the degraded condition both impact on each other.

Alternative 1$_{\text{RedRoute}}$ & Alternative 2$_{\text{GreenRoute}}$:
The vegetation along the northern pipeline route has mostly been transformed from the natural condition with only a few remnant patches of natural vegetation remaining and these also not in a good condition. The vegetation along the route is therefore no longer considered to consist of the threatened Bloemfontein Dry Grassland. This alternative pipeline route should therefore result in a significantly lower impact than the southern alterative. However, there is still a low likelihood of protected species occurring along the patches of remnant natural vegetation and a walkthrough survey of at least these sections should be undertaken to identify and mark protected species. Should any protected species be identified which will be affected by the pipeline construction they should be removed and transplanted adjacent to the pipeline in an area of suitable and similar habitat. Permits must be obtained for those specimens to be transplanted.

Alternative 3$_{\text{BlueRoute}}$:
The southern pipeline route alternative contains sections which has been modified and transformed significantly from the natural condition and these portions are consequently of relatively low conservation value. However, several large portions of relatively natural vegetation still remain, especially in the eastern section of the pipeline. Consisting of Bloemfontein Dry Grassland, a Threatened Ecosystem, and highly likely containing protected species, these sections should be regarded as sensitive and having a significant conservation value. The condition of the vegetation in these sections does however seem to be somewhat degraded along the border

SECTION C: PUBLIC PARTICIPATION

1. ADVERTISEMENT AND NOTICE

Publication name	Die Volksblad	
Date published	28 June 2019	
Site notice position	**Latitude**	**Longitude**
	29°05'44.64"S	26° 19'54.09"E
Date placed	27 June 2019	

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

2. DETERMINATION OF APPROPRIATE MEASURES

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

NOTE:

Identification of possible IAPs includes:
- MMM City Manager
- MMM Planning Division
- MMM Environmental Division
- MMM Ward Councillor: Ward 47
- Dept. of Agriculture
- Dept. of Water and Sanitation
- SAHRA
- FSHRA
- ESKOM
- TELKOM
- Adjacent landowners

Site notices were placed on site.
Landowners & Adjacent Landowners were notified by means of registered mail / hand deliveries.
Authorities were notified via registered mail.
A legal notice was placed in Die Volksblad.

A copy of the dBAR and fBAR will be provided to all the registered parties.
All registered parties will be given the opportunity to comment on the BAR documents.

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

Title, Name and Surname	Affiliation/ key stakeholder status	Contact details (tel number or e-mail address)
Please note that other stake holders were notified by means of on-site notices as well as a notification in Die Volksblad.		

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

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

3. ISSUES RAISED BY INTERESTED AND AFFECTED PARTIES

Summary of main issues raised by I&APs	Summary of response from EAP
Mr Labuschagne info@bloemplan.co.za Telephonically requested additional information regarding the pipeline route. Mr Labuschagne needed clarification on the position of the proposed pipeline.	MDA forwarded a GoogleEarth Marker to Mr Labuschagne on the 5th of September. MDA confirmed that it is proposed that the pipeline will be constructed on the Remainder of the farm Roodewal 262. The applicant will contact the landowner of the said farm directly to discuss the possibility to register a servitude for the pipeline on the said property.
Ms Marguerite Cronje Take note of the proposed routes. Do not wish to register as an IAP for the proposed project.	Noted.
SAHRA 1. In the event of excavations that exceed 1m depth, the newly uncovered sedimentary strata must be monitored by professional palaeontologist during the	Noted. Copies of the dBAR w& fBAR was forwarded to all registered IAPs

excavation phase. 2. Should any objects of archaeological or palaeontological remains be found during construction activities, work must immediately stop in that area and the Environmental Control Officer (ECO) must be informed. 3. The ECO must inform the South African Heritage Recourse Agency (SAHRA) and contact an archaeologist and/or palaeontologist, depending on the nature of the find, to assess the importance and rescue them if necessary (with the relevant SAHRA permit). No work may be resumed in this area without the permission from the ECO and SAHRA. 4. If the newly discovered heritage resource is considered significant a Phase 2 assessment may be required. A permit from the responsible heritage authority will be needed. 5. A Chance Finds Procedures must be developed for the project to ensure that standard protocols and steps are followed should any heritage and/or fossil resources be uncovered during all phases of the project. These procedures should outline the steps and reporting structure to be followed in the instance that heritage resources are found. This must be included in the Environmental Awareness Plan. 6. The final BAR and appendices must be submitted to SAHRA upon submission to DEA. Should the project be granted Environmental Authorisation, SAHRA must be notified and all relevant documents submitted to the case file.	
DESTEA requested clarity on the	• Detailed project description is

following: • Detailed project description specific to the proposed project • Start, middle and end point of the proposed pipelines • Size and length of the pipelines • Alternative copy of the newspaper advertisement	included in the current report • The start, middle and end point of the proposed pipelines was provided to DESTEA • The size and length of the pipelines was provided to DESTEA • An alternative copy of the newspaper advertisement was provided to DESTEA. Copies of the dBAR & fBAR was forwarded to all registered IAPs
NOTE: No other comments were received to date. Any comments received during the Public Participation Process, will be included in the fBAR.	

4. COMMENTS AND RESPONSE REPORT

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

5. AUTHORITY PARTICIPATION

Authorities and organs of state identified as key stakeholders:

Authority / Organ of State	Contact person	Tel No	Fax No	E-mail	Postal Address
MMM Planning Division	Collin Dihemo	051405 8212	051405 8707	collin.dihemo@mangaung.co.za	P.O. Box 3704 Bloemfontein 9300
MMM Environmental Division	Mpolokeng Kolobe	051405 8871	051405 8310	mpolokeng.kolobe@mangaung.co.za	P.O. Box 3704 Bloemfontein 9300
MMM Ward Councillor: Ward 47		051405 8212	051405 8707		P.O. Box 3704 Bloemfontein 9300
MMM City Manager		051405 8911	051405 8707		P.O. Box 3704 Bloemfontein 9300
SAHRA		021462 4509	021462 4502	online submission: http://www.sahra.org.za/	111 Harrington Street CAPE TOWN 8001
TELKOM	Telkom Wayleave Operations Manager For Attention: Ms H. Van den Heever	051 401 6829	051 401 6238	wayleacr@telkom.co.za	Private Bag X20700 Bloemfontein 9300

Authority / Organ of State	Contact person	Tel No	Fax No	E-mail	Postal Address
ESKOM	Environmental Officer Land Development and Environment Eskom Distribution :Mahlatse Moeng	051 404 2287	086 604 5709	Mahlatse.Moeng@eskom.co.za	Eskom Distribution-FSOU Eskom Centre First Floor 120 Henry Street Westdene Bloemfontein 9300
FSHRA		051414 750		mbatha.npz@sacr.fs.gov.za	C/O Henry and East Burger Street Business Partner Building Office 307 Bloemfontein 9301
DWS	Mr W. Grobler	051405 9000			Private Bag X528 Bloemfontein 9300

Authority / Organ of State	Contact person	Tel No	Fax No	E-mail	Postal Address
Department of Agriculture	The Assistant Director	051506 1585			P.O. Box 34521 Faunasig Bloemfontein 9325 94 Charlotte Maxeke St, Bloemfontein, 9301
Department of Police, Roads and Transport	Mr. Hannes				P.O. Box 119 Bloemfontein 9300

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

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

6. CONSULTATION WITH OTHER STAKEHOLDERS

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

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

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

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

SECTION D: IMPACT ASSESSMENT

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

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

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

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

Compliance and Monitoring			
Activity	**Impact summary**	**Significance without mitigation**	**Proposed mitigation**
			available on site. Where possible and available, MSDS should include information on ecological impacts and measures to minimize negative environmental impacts during accidental releases or escapes. • Procedures in the MSDS should be implemented in case of an emergency. • The following documents should be available on site, and made available to the competent authority on request (if applicable): - Complaints Register - Environmental Incident Register - Disposal Certificates of Waste and Waste Water Generated during the construction / operational phase - Environmental Monitoring (Audit) Reports - Written Corrective Action Instructions - Environmental Authorisation - DWS Permit / License - Blasting Permit - EMPr - Necessary drawings for construction activities near roads are to be submitted to the relevant authority

Compliance and Monitoring			
Activity	**Impact summary**	**Significance without mitigation**	**Proposed mitigation**
			(i.e. SANRAL / Provincial Department of Roads / Municipality's Department of Roads) for approval, and the upgrades are to be implemented

Planning and Design phase			
Activity	**Impact summary**	**Significance without mitigation**	**Proposed mitigation**
Planning and design	**Direct impacts:** • None	Medium – High Negative	• No environmental mitigation measures are required during the planning phase on the proposed site, as no mitigation measures are to be implemented on site during the planning phase. • However, the applicant, engineers, environmental consultants and specialists should take the following steps during the planning phase: - Permits will be obtained for the removal / transplantation of protected species (if any) that are located within the construction area where no alternatives are possible. - A monitoring system should be implemented to determine the occurrence (if any) of any fuel / oil spillages during the construction and operational phase. - The necessary Environmental Authorisation will be obtained before any activities listed in the Regulations are undertaken. - In addition, the necessary DWS registrations will be obtained, before any construction activities near watercourses are undertaken. - The necessary precautions with regard to road safety will be implemented for construction work
	Indirect impacts: • None	Medium – High Negative	
	Cumulative impacts: • None	Medium – High Negative	

Planning and Design phase			
Activity	**Impact summary**	**Significance without mitigation**	**Proposed mitigation**
			to be undertaken within road crossings (if any). - Proper sanitation, potable water and waste facilities will be in place before construction activities are undertaken. - A blasting permit will be obtained before blasting activities is undertaken (if any). - The design and layout of the proposed project will take the possibility of flooding, erosion and pollution into consideration. - Necessary drawings construction activities near roads are to be submitted to the relevant authority (i.e. SANRAL / Provincial Department of Roads / Municipality's Department of Roads) for approval, and the upgrades are to be implemented - The Contractor must acquire a permit, issued by the relevant heritage resources authority, in the instance that any destruction, damage, excavation, alteration, defacing or any other disruption are to take place to any archaeological material (including bridges older than 60 years).
	Note:		

Planning and Design phase			
Activity	**Impact summary**	**Significance without mitigation**	**Proposed mitigation**
	• Should the above not be taken into consideration during the Planning and Design Phase, the environmental impacts associated with the construction and operation phase will be of high significance as the environment will possibly be negatively affected.		

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

Construction phase			
Activity	**Impact summary**	**Significance without mitigation**	**Proposed mitigation**
	• Pollution(groundwater, surface water, soil and air) • Erosion • Loss of biodiversity (vegetation & animal life)		- Ready-mix Areas - Stockpile Areas - Waste Disposal Facilities - Hazardous Substances Storage Area - Construction areas within 32m of a watercourse - Etc. • Designate the boundaries of the active construction start-up site, by erecting fencing / danger tape (where applicable) • Fence off operational footprint area (if possible) to ensure all operational activities are contained within the designated area. • All construction and operational activities must be contained within the demarcated servitude determined in consultation with the ECO. • Care will be taken to prevent unnecessary damage to vegetation near to construction activities. • The necessary precautions with regard to road safety will be implemented for construction work within road crossings (if any). • Proper sanitation, water and waste facilities will be

Construction phase			
Activity	**Impact summary**	**Significance without mitigation**	**Proposed mitigation**
			in place for construction workers throughout the construction phase. • Chemical toilets will be cleaned and serviced regularly and proof thereof will be available on site. • Potable water will be made available daily to workers on site. • Fire-fighting equipment will be available on site, where applicable. • If artefacts or graves are uncovered during construction activities, work in the immediate vicinity will be stopped until the project Archaeologist and SAHRA has been consulted. • Adjacent landowners will be notified of proposed blasting, 24 hours prior to blasting activities. • All relevant IAPs will be notified 24 hours prior to any known potential risks associated with the site and the activities to be undertaken on site.
Site access	**Direct impacts:** • Loss of vegetation • Loss of animal life • Erosion • Pollution	Medium Negative	• Necessary drawings for the upgrading of intersections / attachment to bridges (if any) / construction activities near roads are to be submitted to SANRAL / Provincial Department of Roads / Municipality's Department of Roads for

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

Construction phase			
Activity	**Impact summary**	**Significance without mitigation**	**Proposed mitigation**
	on site • Various health and safety aspects		surrounding areas, without written approval from the landowner. • No smoking or open fires will be allowed near storage facilities. • No waste may be dumped on site. • Employees should make use of the ablution facilities provided.
	Indirect impacts: • Loss of vegetation • Loss of animal life • Erosion • Pollution • Storm water contamination • Occurrence of waste on site • Various health and safety aspects • Fire outbreaks	High Negative	
	Cumulative impacts: • Loss of vegetation • Loss of animal life • Erosion • Pollution • Storm water contamination • Occurrence of waste	High Negative	

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

Construction phase			
Activity	**Impact summary**	**Significance without mitigation**	**Proposed mitigation**
	species • Possible impact on heritage artefacts • Loss of fauna on site.		have been adequately re-vegetated. • Concurrent rehabilitation of disturbed areas will be undertaken to help the recovery of the vegetation. • Stockpiled soil will be stockpiled in an area where it will not be disturbed by vehicles. • Stockpiled soil will be protected from washing away during rainstorms. For example: - Bricks may be placed around the stockpiles, to limit the loss thereof due to rainy events. - Stockpiles should not be higher than 1.5 m. - The gradient of stockpiles should not be greater than 1:1.5. • Stockpiles should be located away from drainage lines, watercourses and areas of temporary flood. • All soil excavated is to be separated into top- and subsoil. Subsoil must be used for backfilling and topsoil for landscaping and rehabilitation of disturbed areas. • Stockpiled material will be placed on the cleared areas once construction is completed. Re-spreading of topsoil is preferably to be done to a maximum of 10 cm, or as indicated by the
	Cumulative impacts: • Erosion • Establishment of alien vegetation species	Medium Negative	

Construction phase			
Activity	**Impact summary**	**Significance without mitigation**	**Proposed mitigation**
			ecological specialist. • Fertilisers should be used where topsoil and subsoil was mixed or not up to original standard. • Indigenous tree species in the vicinity of the operational site should be marked with danger tape. Disturbance to such species should be avoided, where possible. Permit should be obtained for the removal / transplantation of these species. • A permit for the removal of protected plant species will be obtained before the removal of these species (if any). • An alien control and monitoring programme will be developed starting during the construction phase and will be carried over into the operational phase. • Any proclaimed weed or alien species that germinates during the contract period will be cleared by hand / approved chemicals before flowering thereof. • Imported fill material will be monitored during and after construction for the presence of any alien species. Any such species will be removed

Construction phase			
Activity	**Impact summary**	**Significance without mitigation**	**Proposed mitigation**
			immediately. • Fire fighting equipment will be available on site. • Species, especially grasses, trees and shrubs occurring in the region will be used to rehabilitate disturbed areas. • Compacted soils (such as dirt tracks not to be utilised during the operational phase) must be ripped to ensure the establishment of natural occurring vegetation. • Concurrent rehabilitation should be undertaken, where possible. • Vegetation clearance will be limited to the required area. • Speed limit will be enforced on the construction vehicles and these vehicles will only make use of designated roads / pathways. • Dust control measures will be implemented if nuisance dust generation occurs during the construction period. • All archaeological findings (if any) should be recorded and reported to SAHRA. No construction activities in the area may proceed without the authorisation from SAHRA.

Construction phase			
Activity	**Impact summary**	**Significance without mitigation**	**Proposed mitigation**
			• Storm water measures will be implemented in order to manage storm water and this will also prevent erosion. • Visual inspections for the occurrence of erosion should be undertaken on a weekly basis. • No animals may be captured / harmed / killed on site. • Any occurrences of harmed animals should be reported to the ECO and recorded as such.
Minimise contamination and sterilisation of soil	**Direct impacts:** • Slow regrowth of natural occurring vegetation during the rehabilitation phase • Loss of vegetation	Medium Negative	• Use of potentially polluting and hazardous substances should be strictly controlled. • If soil is significantly contaminated by hazardous substances, then this soil is considered as hazardous and should be disposed of according to best practices. • Repair / maintenance will be conducted on site, and impacts like oil spills should be appropriately mitigated. Spill response procedures must be clearly defined and well known by all staff. • All threatened or protected plant species as specified by the NEM: Biodiversity Act (2004) will be identified on site. Permits are required for the removal / transplantation of these plants.
	Indirect impacts: • Loss of vegetation • Loss of animal life • Establishment of alien vegetation • Erosion	High Negative	
	Cumulative impacts: • Loss of vegetation	High Negative	

Construction phase			
Activity	**Impact summary**	**Significance without mitigation**	**Proposed mitigation**
	• Loss of animal life • Establishment of alien vegetation • Erosion		
Trenching, placing of pipeline and covering of pipeline	**Direct impacts:** • Visual impact of rock and spoil material dumps from trench excavation all along the route • Noise elevation due to construction activities • Nuisance dust generation	Medium – High Negative	• Site will be kept neat and tidy. • Appropriate area will be identified as a stockpiling area. • Speed limit will be enforced on the construction vehicles and these vehicles will only make use of designated roads / pathways. • Dust control measures will be implemented if nuisance dust generation occurs during the construction period. • Stockpiled material will be stored in such a way to limit the loss thereof. For example: - Bricks may be placed around the stockpiles, to limit the loss thereof due to rainy events. - Stockpiles should not be higher than 1.5 m. - The gradient of stockpiles should not be greater than 1:1.5. • Noise control measures will be implemented. • All employees will be provided with the correct
	Indirect impacts: • Erosion • Establishment of alien / invader vegetation species • Possible impact on heritage artefacts • Loss of fauna on site	Medium – High Negative	

Construction phase			
Activity	**Impact summary**	**Significance without mitigation**	**Proposed mitigation**
	Cumulative impacts: • Erosion • Establishment of alien vegetation species	Medium – High Negative	PPE. • Establishment of alien / invader vegetation will be monitored and these species will be removed by hand or by an approved chemical before gestation thereof. • All archaeological findings (if any) should be recorded and reported to SAHRA. No construction activities in the area may proceed without the authorisation from SAHRA. • Storm water measures will be implemented in order to manage storm water and this will also prevent erosion. • Visual inspections for the occurrence of erosion should be undertaken on a weekly basis. • No animals may be captured / harmed / killed on site. • Any occurrences of harmed animals should be reported to the ECO and recorded as such.
Ablution Facilities	**Direct impacts:** • Pollution of surface water runoff • Pollution of soil	Negative	• No open areas or the surrounding vegetation may be used as 'toilet facilities'. • Toilets should be available for all employees. Where waterborne sewerage is not available, the ECO must designate an area within the boundaries
	Indirect impacts:	Medium	

Construction phase			
Activity	**Impact summary**	**Significance without mitigation**	**Proposed mitigation**
	• Pollution of surface water runoff • Pollution of soil • Pollution of groundwater • Odour • Unnatural enrichment of soil	Negative	of the site for the erection of portable chemical toilets. • Toilet facilities shall occur at a minimum ration of 1 toilet per 15 employees. • Toilets shall be maintained in a hygienic state and serviced when required. • Temporary toilets should be serviced regularly and the contents be removed to a licensed disposal facility.
	Cumulative impacts: • Pollution of surface water runoff • Pollution of soil • Pollution of groundwater • Odour • Unnatural enrichment of soil	High Negative	
Safeguard water resources	**Direct impacts:** • Contamination of surface water resources	High Negative	• No activities will be undertaken within 32 m of a watercourse / within the 1:100 year floodline / 500m of a wetland, without the necessary authorisations (for example from DESTEA and DWS). • Caution will be taken to ensure that construction materials are not dumped or stored within storm
	Indirect impacts: • Erosion	High Negative	

Construction phase			
Activity	**Impact summary**	**Significance without mitigation**	**Proposed mitigation**
	• Change in flow of water course • Pollution (surface water, groundwater and soil)		water management systems. • Construction activities in the storm water infrastructure will be limited through proper demarcation and appropriate environmental awareness training. • The Contractor is responsible to inform all staff of the need to be vigilant against any practice that will have a harmful effect on waterways. • Infilling, excavation, drainage and hardening of surfaces will not occur unnecessarily in storm water infrastructure. • Emergency plans will be in place in case of fuel spillages (to limit the occurrence of soil as well as groundwater pollution). • A monitoring system should be implemented to determine the occurrence (if any) of any fuel / oil spillages during the construction or operational phase. • The necessary mitigation measures should be implemented immediately, should any leakages / spills be detected. • Weather forecasts from the South African Weather Bureau of up to three days in advance will be
	Cumulative impacts: • Erosion • Change in flow of water course • Pollution (surface water, groundwater and soil)	High Negative	

Construction phase			
Activity	**Impact summary**	**Significance without mitigation**	**Proposed mitigation**
			monitored on a daily basis to avoid exposing soil or construction works or materials during a storm event and appropriate action will be taken in advance to protect construction works should a storm event be forecasted. • All no-go areas will be demarcated under guidance of the Environmental Control Officer (ECO). • The design of drainage systems will ensure there is no contamination, eutrophication or increased. Drainage systems will be maintained regularly in order to minimize the runoff of harmful chemical substances into the waterway(s). • It will be ensured that the construction activities have minimal effects on the flow of water through the storm water infrastructure. • No erosion or siltation may occur due to any construction or operational activities. • Construction and operational activities should take the water course's boundaries and associated buffer zones that should be avoided, into consideration. • Occurrence of erosion will be monitored.

Construction phase			
Activity	**Impact summary**	**Significance without mitigation**	**Proposed mitigation**
			Reparations will be undertaken as soon as possible.
Workings within / near to watercourses	**Direct impacts:** • Temporary blockage of water • Loss of vegetation • Loss of aquatic animal life • Erosion • Scouring	Medium – High Negative	• Storm water measures will be implemented in order to manage storm water and this will also prevent erosion. • Construction activities in waterways should be undertaken in such a manner that no containment of water is required, where possible. 2/3 of the waterways may be diverted at a time, where required. • The necessary authorisations should be obtained from DWS, should the containment of water be required. • All scour outlets will be provided with stone pitched and /or gabion mattresses lined channels. • Water course beds will be covered with gabion mattress including embankment stabilization above the excavation area (where required) • Visual inspections for the occurrence of erosion should be undertaken on a weekly basis.
	Indirect impacts: • Ponding of water during construction at waterways (due to blockage of waterways). • Surface and groundwater pollution due to spillage of potential hazardous substances such as hydraulic material and untreated sewage	Medium – High Negative	

Construction phase			
Activity	**Impact summary**	**Significance without mitigation**	**Proposed mitigation**
	explained above. • Impact on waterways (including the natural habitat of the area), soil disturbances and including pollution. • Possible change of flow of water in waterways during the construction activities near / through the waterways. • Erosion • Scouring • Loss of biodiversity		
	Cumulative impacts: • Erosion • Loss of vegetation • Scouring • Possible change of flow of water in waterways • Loss of biodiversity	High Negative	

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

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

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

Construction phase			
Activity	**Impact summary**	**Significance without mitigation**	**Proposed mitigation**
			pedestrian and vehicular traffic is accommodated at all times. - The contractor will be required to maintain adequate access to all public and private property at all times. - Contractor will supply, erect and maintain road signs for all work areas conforming to the prescribed layout and requirement of the South African Road Traffic Signs Manual and other relevant notices. • Fire extinguishers will be available on site and in the construction camp (if any). • The contractor will be required to maintain adequate access to all public and private property at all times. • Speed limits of 20km/h will be enforced. • All relevant IAPs will be notified prior to any blasting activities • All relevant IAPs will be notified 24 hours prior to any known potential risks associated with the site and the activities to be undertaken on site. • The necessary precautions with regard to road safety will be implemented for construction work

Construction phase			
Activity	**Impact summary**	**Significance without mitigation**	**Proposed mitigation**
			within road crossings. • All injuries should be recorded.
Heritage	**Direct impacts:** • Harm to unknown heritage resources	Negative	• Approval is required from SAHRA and the relevant road authorities if any attachment will be made to bridges. • In the case of the discovery of any heritage, archaeological or palaeontological significance, the work in the area will be stopped and reported to the archaeologist and SAHRA. Any construction activities in the nearby vicinity may only commence after approval is obtained from SAHRA as well as the ECO. • Known heritage resources (if any) must be avoided as far as possible. • Employees should be encouraged and informed of the need to be on the look-out for potential fossils / buried archaeological material. • In the case of the discovery of any stone tools or other archaeological or palaeontological material, the work in the immediate vicinity should temporarily cease and reported to the archaeologist and SAHRA. Should any human remains be exposed, the archaeologist as well as
	Indirect impacts: • Loss of heritage resources	High Negative	
	Cumulative impacts: • Loss of heritage resources	High Negative	

Construction phase			
Activity	**Impact summary**	**Significance without mitigation**	**Proposed mitigation**
			the local SAPS should be notified. • If any evidence of archaeological sites or remains (e.g. remnants of stone-made structures, indigenous ceramics, bones, stone artefacts, ostrich eggshell fragments, charcoal and ash concentrations), fossils or other categories of heritage resources are found during the proposed development, SAHRA APM Unit (Tel: 021 462 5402) must be alerted. If unmarked human burials are uncovered, the SAHRA Burial Grounds and Graves (BGG) Unit (Tel: 012 320 8490), must be alerted immediately. A professional archaeologist or palaeontologist, depending on the nature of the finds, must be contacted as soon as possible to inspect the findings. If the newly discovered heritage resources prove to be of archaeological or palaeontological significance, a Phase 2 rescue operation may be required subject to permits issued by SAHRA. • Appropriate measures should be undertaken by the ECO until the archaeologist / SAPS visits the site. This should include the following: - Site should be fenced with 'danger tape'

Construction phase			
Activity	**Impact summary**	**Significance without mitigation**	**Proposed mitigation**
			- Position of finding should be recorded - Depth of finding should be recorded - Digital image of the finding should be taken - No information on the findings may be made public without the consent of the archaeologist / SAPS. - Construction activities in the area may only continue after approval from the archaeologist and SAHRA.
Noise and dust control	**Direct impacts:** • Elevation of noise levels • Generation of nuisance dust	Negative	• Construction activities will be limited to normal daytime hours, where possible. • Noise levels will be kept as low as possible during the construction phase in order not to disturb adjacent landowners. • Proper mitigation measures will be implemented to limit noise (e.g. the installation of silencers, where required). • Proper mitigation measures will be implemented to limit the formation of dust (e.g. wetting of construction area, when required). • The speed of the construction vehicles will be limited to avoid dangerous conditions, the formation of dust and the excessive deterioration
	Indirect impacts: • Air pollution • Increase in noise levels outside of the proposed construction site may have a negative impact on surrounding	Negative	

Construction phase			
Activity	**Impact summary**	**Significance without mitigation**	**Proposed mitigation**
	landowners / occupants		of roads being used.
	Cumulative impacts: • Air pollution • Increase in noise levels outside of the proposed construction site may have a negative impact on surrounding landowners / occupants	Negative	
Handling and Storage of materials	**Direct impacts:** • Soil pollution • Air pollution • Fire outbreaks • Surface water pollution • Injuries • Health issues	High Negative	• All chemicals used during the development, including fuel, will be stored in a proper storeroom or protected area to prevent pollution. • Vehicles will be serviced at designated areas. No oil, diesel or other chemicals may be spilled or discharged anywhere. • Where applicable, the contractors will ensure that all relevant national, regional and local legislation regarding storage, transport, use and disposal of petroleum, chemical, harmful or hazardous
	Indirect impacts: • Loss of vegetation and	High Negative	

Construction phase			
Activity	**Impact summary**	**Significance without mitigation**	**Proposed mitigation**
	animal life due to fire outbreaks • Soil pollution • Air pollution • Surface and groundwater pollution • Injuries • Health issues		substances and materials are adhered to, where necessary. • Cement and concrete mixing, if applicable, will only take place within the construction site. No concrete will be mixed directly on the ground. • All environmental problems occurring on the site such as chemical spillage, wasteful water disposal, etc. will be reported to the ECO. The ECO should implement best practices to rectify the impacts thereof on the environment. • Spill response equipment must be available during the handling and loading of hazardous waste (if any) • Hazardous substances such as above ground fuel tanks are to be stored in bunded areas. • Bund walls will have a capacity of at least 110% of the total capacity of the stored volume. • No oil, diesel or other chemicals may be spilled or discharged anywhere and contact with bare soil should be avoided at all cost. • Drip trays will be used during the servicing of vehicles as well as the transfer of chemicals / substances from transportation vehicles.
	Cumulative impacts: • Loss of vegetation and animal life due to fire outbreaks • Soil pollution • Air pollution • Surface and groundwater pollution • Injuries • Health issues	High Negative	

Construction phase			
Activity	**Impact summary**	**Significance without mitigation**	**Proposed mitigation**
			• A monitoring system should be implemented to determine the occurrence (if any) of any fuel / oil spillages from the fuel tanks / wash-bay during the operational phase. • The necessary mitigation measures should be implemented immediately, should any leakages / spills be detected. • Material stockpiles, such as bricks and pipes, must be stable and well secured to avoid collapse and possible injury. • Material and Safety Data Sheets (MSDSs) should be readily available on site for all hazardous materials. MSDSs should additionally include information on ecological impacts and measures to minimise negative environmental impacts during accidental releases or escapes. • Storage areas should be kept clean and free from any accumulation of combustible matter (such as paper) and any possible source of ignition should be removed.
Hazardous waste management	**Direct impacts:** • Soil pollution • Air pollution	High Negative	• Hazardous wastes must be separated from general wastes, stored within secondary containment in appropriate containers.

Construction phase			
Activity	**Impact summary**	**Significance without mitigation**	**Proposed mitigation**
	• Fire outbreaks • Surface water pollution • Injuries • Health issues		• Proper storage facilities for the storage of hazardous / dangerous goods must be provided to prevent the migration of spillage into the soil and or groundwater. • Certificates / waybills of hazardous waste disposals are to be available on request as well as auditing purposes. This includes the removal of soil contaminated with hydrocarbons. • Storage of hazardous substances and refuelling areas are to be bunded with an impermeable liner to protect groundwater quality and must comply with the relevant SANS codes. • Areas used for the storage of hazardous materials are to be clearly indicated as such.
	Indirect impacts: • Loss of vegetation and animal life due to fire outbreaks • Soil pollution • Air pollution • Surface and groundwater pollution • Injuries • Health issues	High Negative	
	Cumulative impacts: • Loss of vegetation and animal life due to fire outbreaks • Soil pollution • Air pollution • Surface and groundwater pollution	High Negative	

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

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

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

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

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

Construction phase			
Activity	**Impact summary**	**Significance without mitigation**	**Proposed mitigation**
	Cumulative impacts: • Loss of vegetation and animal life due to fire outbreaks • Soil pollution • Surface and groundwater pollution • Injuries • Health issues	High Negative	occurred, are closed out and appropriate measures are taken to prevent further incidents. • Incidents must be reported to DWS within 24 hours. • Contaminated soil must be disposed of in a hazardous materials skip and removed to a licensed hazardous landfill facility by a licensed contractor. • Contaminated water must be decanted into drums and stored until disposal by a registered waste transported is undertaken.

Operational phase			
Activity	**Impact summary**	**Significance without mitigation**	**Proposed mitigation**
This phase consists of the use of the water pipeline	**Direct impacts:** • Deterioration of the infrastructure in the long term.	Medium – Low Negative	• Maintenance and repair will be undertaken on the infrastructure when necessary. • Soil erosion occurrences will be attended to immediately. • Establishment of alien vegetation will be monitored and alien species will be removed by hand or by an approved chemical before gestation thereof. • Proper monitoring of various aspects (such as monitoring of the potable water quality should the potable water not be obtained from the municipal supplies) should be undertaken on a regular basis. • Water to be transported in the pipeline should adhere to the DWS standards. • An emergency plan should be developed in case the water does not conform to the DWS standards. • Visual inspections should be undertaken at least every 6 months to investigate the occurrence of sedimentation and erosion. • Proper erosion mitigation measures should be implemented. • Stabilise the banks of the watercourses, where necessary.
	Indirect impacts: • Establishment of alien / invader species due to previous disturbance will also be associated with this phase. • Erosion • Possible change in the morphology of the watercourses due to erosion of the banks	Medium – Low Negative	
	Cumulative impacts: • Establishment of alien / invader species due to	Medium – Low Negative	

Operational phase			
Activity	**Impact summary**	**Significance without mitigation**	**Proposed mitigation**
	previous disturbance will also be associated with this phase. • Erosion • Possible change in the morphology of the watercourses due to erosion of the banks		

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

Decommissioning phase			
Activity	**Impact summary**	**Significance without mitigation**	**Proposed mitigation**
during the construction phase. All disturbed areas will be rehabilitated according to best practices. A rehabilitation plan will be developed, if it is decided to remove the proposed pipeline and associated infrastructure before the cessation of the operation aspects of the proposed project. The rehabilitation plan will include management and mitigation measures to be implemented during the			• Establishment of extensive alien species will be monitored.

Decommissioning phase			
Activity	**Impact summary**	**Significance without mitigation**	**Proposed mitigation**
decommissioning of the project			

No-go Option			
Activity	**Impact summary**	**Significance without mitigation**	**Proposed mitigation**
Keeping the status quo – no sufficient volumes of potable water available to the community	**Direct impacts:** • No direct environmental impacts.	N/A	• Additional potable water resources should be investigated to assist the Municipality to provide basic services to the community.
	Indirect impacts: • The Municipality will not be able to provide the community with sufficient volume of potable water, resulting in a water shortage and possible water restrictions on a regular basis	High Negative	
	Cumulative impacts: • As the project is described as a basic service, the lack thereof will lead to major social and	High Negative	

No-go Option			
Activity	**Impact summary**	**Significance without mitigation**	**Proposed mitigation**
	economic impacts that will indirectly cause severe environmental concerns.		

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

2. ENVIRONMENTAL IMPACT STATEMENT

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

NOTE:
By implementing the recommendations of the ecological report, heritage report, this document and the EMPr, the impact of the pipeline's construction phase will be kept to a minimum.

Preferred Alternative 1, 2 and 3

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

No-go alternative (compulsory)

The no-go alternative is not seen as a reasonable / feasible alternative as this will place the Mangaung Metropolitan Municipality in such a position that it will not be able to provide Bloemfontein with recycled water, resulting in a possible water shortage and water restrictions on a regular basis.

The proposed pipeline and associated infrastructure is considered essential to enable the Mangaung Metropolitan Municipality to provide the Bloemfontein area with adequate basic services, as the proposed project entails the transportation of treated waste water, to be recycled at the Maselspoort WTW.

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

SECTION E. RECOMMENDATION OF PRACTITIONER

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

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

N/A

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

Refer to the EMPr in Appendix G for recommended mitigation measures.		
Is an EMPr attached?	YES	

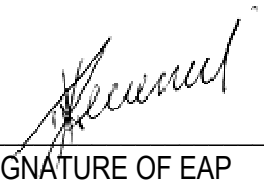
The EMPr must be attached as Appendix G.

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

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

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

_Neil Devenish__
NAME OF EAP



_____ _____
SIGNATURE OF EAP DATE

SECTION F: APPENDIXES

The following appendixes must be attached:

Appendix A: Maps

Appendix B: Photographs

Appendix C: Facility illustration(s)

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

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

Appendix F: Impact Assessment

Appendix G: Management Plans
Appendix G_1: Environmental Management Programme
Appendix G_2: Pipeline Maintenance Plan
Appendix G_3: Water Resource Monitoring Plan/Guideline
Appendix G_4: Stormwater Management Plan

Appendix H: Details of EAP and expertise

Appendix I: Specialist's declaration of interest
NOTE: Declaration by EAP is attached to Appendix H.
Heritage
Ecological

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

APPENDIX A

Maps

Map 1

TYPE OF PLAN: LOCALITY PLAN

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

PROJECT:
THE PROPOSED CONSTRUCTION OF A PIPELINE, BLOEMFONTEIN

PROJECT BY:
MANGAUNG METROPOLITAN MUNICIPALITY

DRAWN BY:
HS

Map 2

Legend:

- Approved Pipeline
- Alternative 1 Redroute
- Alternative 2 Greenroute
- Alternative 3 Blueroute

Take Note:

Alternative 2 Greenroute follows the same route as Alternative 1 Redroute, except for a small section of pipeline, indicated in green on the map

TYPE OF PLAN: LOCALITY PLAN

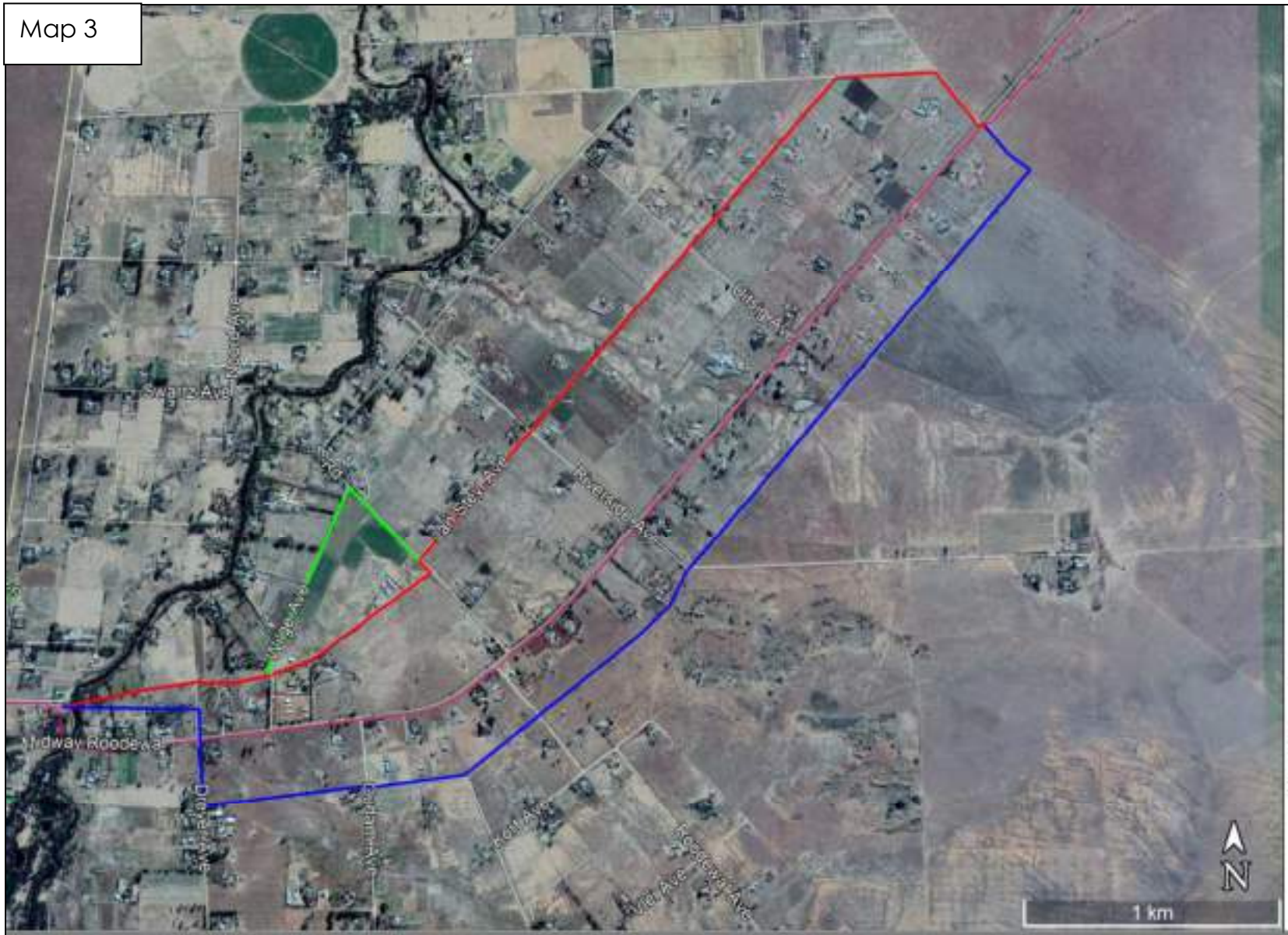
mda Town & Regional Planners, Environmental & Development Consultants
T: 051 447 1583 | P.O. Box 20988, Willows, Bloemfontein, 9320
F: 086 455 2568 | 9 Barnes Street, Westdene, Bloemfontein, 9301

PROJECT:
THE PROPOSED CONSTRUCTION OF A PIPELINE, BLOEMFONTEIN

PROJECT BY:
MANGAUNG METROPOLITAN MUNICIPALITY

DRAWN BY:
HS

Map 3



Legend:

- Approved Pipeline
- Alternative 1 Redroute
- Alternative 2 Greenroute
- Alternative 3 Blueroute

Take Note:

Alternative 2 Greenroute follows the same route as Alternative 1 Redroute, except for a small section of pipeline, indicated in green on the map

Coordinates:

Start: 29° 5'44.66"S, 26°19'52.28"E
End: 29° 4'29.57"S, 26°22'6.52"E

TYPE OF PLAN: LOCALITY PLAN

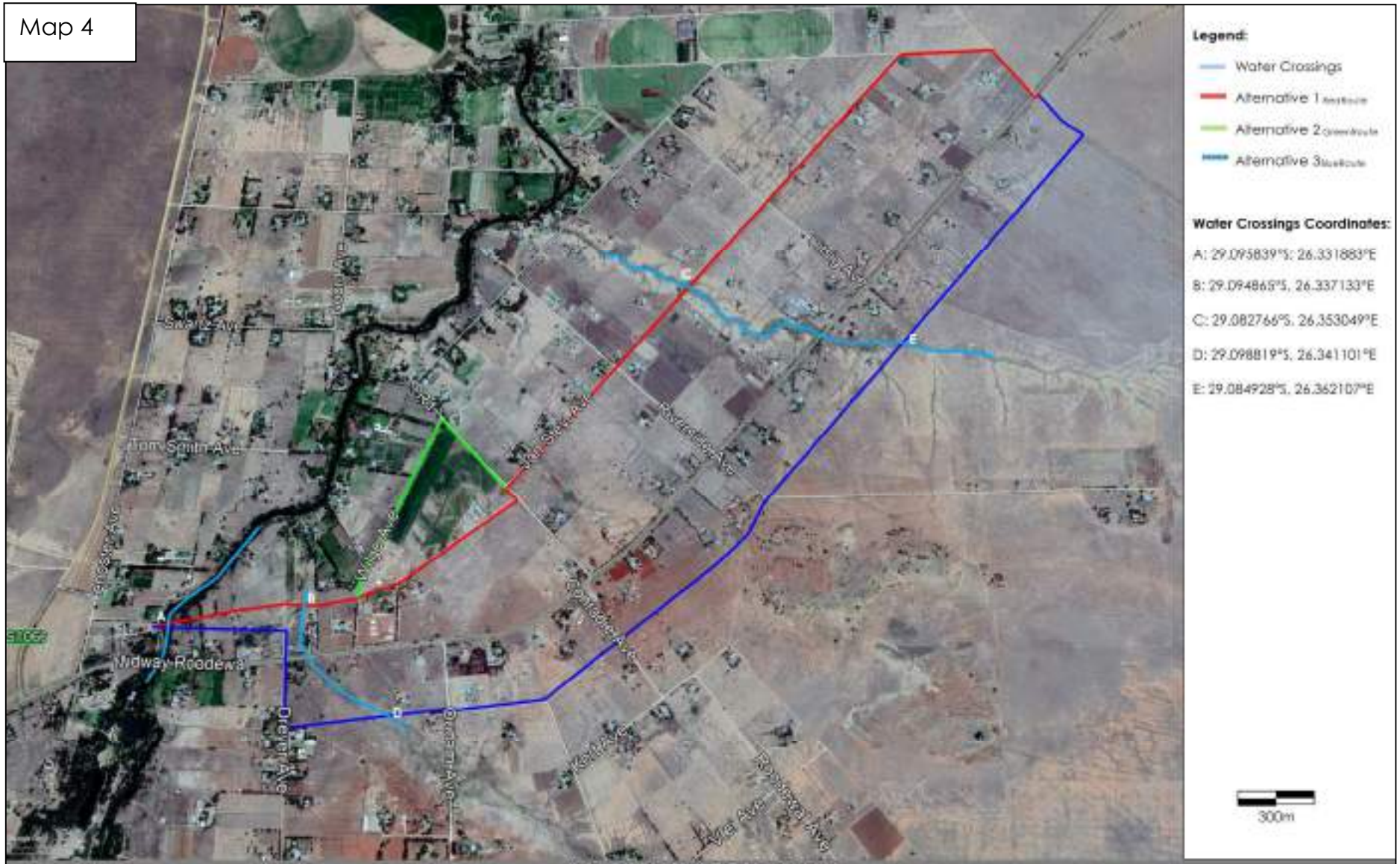
mda
Town & Regional Planners, Environmental & Development Consultants
T: 051 447 1583 | P.O. Box 20290, Willows, Bloemfontein, 9320
F: 086 455 2568 | 9 Barnes Street, Westdene, Bloemfontein, 9301

PROJECT:
THE PROPOSED CONSTRUCTION OF A PIPELINE, BLOEMFONTEIN

PROJECT BY:
MANGAUNG METROPOLITAN MUNICIPALITY

DRAWN BY:
HS

Map 4



TYPE OF PLAN: LOCALITY PLAN

mda Town & Regional Planners, Environmental & Engineering Consultants
Tel: 051 447 1583 | P.O. Box 20258, Willows, Bloemfontein, 9333

PROJECT:
THE PROPOSED CONSTRUCTION OF A PIPELINE, BLOEMFONTEIN

PROJECT BY:
MANGAUNG METROPOLITAN MUNICIPALITY

DRAWN BY:
HS

Nr	Watercourse Name	Coordinates of Crossing	Photograph
1	D, in Map 4	S 29.098819°, E 26.341101°	 View of the small stream with the point of survey (red) and the actual point of crossing indicated (yellow). Note the grass dominated main channel and apparent natural surroundings.
2	B, in Map 4	S 29.094865°, E 26.337133°	 View of the stream system along the northern pipeline route (red). Note the artificial impoundment (yellow) and stream flowing from it. This area is

Nr	Watercourse Name	Coordinates of Crossing	Photograph
			clearly degraded and the stream heavily modified.
3	E, in Map 4	S 29.084928°, E 26.362107°	 View of the stream with the actual point of crossing indicated (red). Note the largely natural surroundings.
4	C, in Map 4	S 29.082766°, E 26.353049°	 View of the stream upstream of the point of crossing. Note clear ponding

Nr	Watercourse Name	Coordinates of Crossing	Photograph
			caused by the road crossing. The flood bench is also quite visible here (red).
5	Large Crossing A, in Map 4	S29.095839°; E26.331883°	

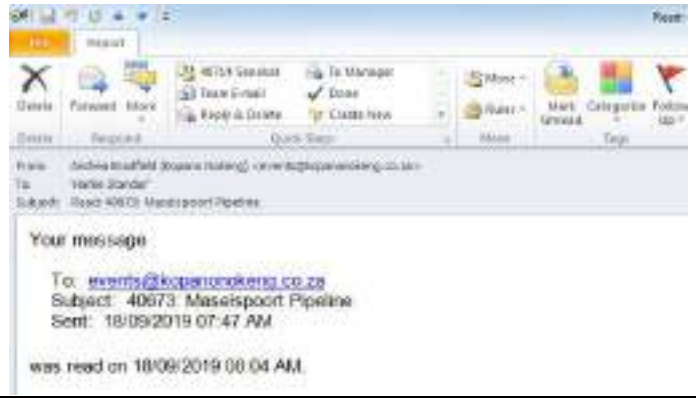
TABLE 1: PROPERTY DESCRIPTION AND LAND USE ZONING OF PROPERTIES ASSOCIATED WITH THE PROPOSED PIPELINE CONSTRUCTION ACTIVITIES, AS WELL AS PROPERTIES ADJACENT			
PROPERTY DESCRIPTION	**SG NUMBER**	**LAND USE ZONING**	**MANNER OF NOTIFICATION**
REMAINDER OF THE FARM ROODEWAL 2942	F00300000000294200000	AGRICULTURAL	REGISTERED POST & E-MAIL KOPANO NOKENG /14 MIDWAY /ROODEWAL / BLOEMFONTEIN /9326 
RIVERSIDE SMALL HOLDINGS RE/6	F00300690000000600000	SMALL HOLDINGS	PAMPHLET DISTRIBUTION PROCESS
RIVERSIDE SMALL HOLDINGS RE/7	F00300690000000700000	SMALL HOLDINGS	REGISTERED POST WILHELMINA FREDRIKA KRUGER 73 LA PROVANCE WEG / BETHLEHEM / 9700 / C: 0837081540 / DRE.KRUGER@SPAR.CO.ZA
RIVERSIDE SMALL HOLDINGS 1/7	F00300690000000700001	SMALL HOLDINGS	PAMPHLET DISTRIBUTION PROCESS
RIVERSIDE SMALL HOLDINGS RE/8	F00300690000000800000	SMALL HOLDINGS	PAMPHLET DISTRIBUTION PROCESS

TABLE 1: PROPERTY DESCRIPTION AND LAND USE ZONING OF PROPERTIES ASSOCIATED WITH THE PROPOSED PIPELINE CONSTRUCTION ACTIVITIES, AS WELL AS PROPERTIES ADJACENT			
PROPERTY DESCRIPTION	**SG NUMBER**	**LAND USE ZONING**	**MANNER OF NOTIFICATION**
ROODEWAL SMALL HOLDINGS RE/13	F00300740000001300000	SMALL HOLDINGS	PAMPHLET DISTRIBUTION PROCESS / REGISTERED POST H E VENTER 13 WILGE AVENUE / RODEWAL / BLOEMFONTEIN / 9301 T: 0532059200 / C: 0834403493 / BETSIE@SHISAS.COM
ROODEWAL SMALL HOLDINGS RE/25	F00300740000002500000	SMALL HOLDINGS	PAMPHLET DISTRIBUTION PROCESS
ROODEWAL SMALL HOLDINGS RE/26	F00300740000002600000	SMALL HOLDINGS	PAMPHLET DISTRIBUTION PROCESS
ROODEWAL SMALL HOLDINGS RE/27	F00300740000002700000	SMALL HOLDINGS	PAMPHLET DISTRIBUTION PROCESS
ROODEWAL SMALL HOLDINGS RE/40	F00300740000004000000	SMALL HOLDINGS	PAMPHLET DISTRIBUTION PROCESS
ROODEWAL SMALL HOLDINGS RE/41	F00300740000004100000	SMALL HOLDINGS	PAMPHLET DISTRIBUTION PROCESS
ROODEWAL SMALL HOLDINGS RE/42	F00300740000004200000	SMALL HOLDINGS	PAMPHLET DISTRIBUTION PROCESS
ROODEWAL SMALL HOLDINGS RE/54	F00300740000005400000	SMALL HOLDINGS	PAMPHLET DISTRIBUTION PROCESS
ROODEWAL SMALL HOLDINGS RE/55	F00300740000005500000	SMALL HOLDINGS	PAMPHLET DISTRIBUTION PROCESS
ROODEWAL SMALL HOLDINGS RE/56	F00300740000005600000	SMALL HOLDINGS	PAMPHLET DISTRIBUTION PROCESS
ROODEWAL SMALL	F00300740000006300000	SMALL HOLDINGS	REGISTERED POST

TABLE 1: PROPERTY DESCRIPTION AND LAND USE ZONING OF PROPERTIES ASSOCIATED WITH THE PROPOSED PIPELINE CONSTRUCTION ACTIVITIES, AS WELL AS PROPERTIES ADJACENT			
PROPERTY DESCRIPTION	**SG NUMBER**	**LAND USE ZONING**	**MANNER OF NOTIFICATION**
HOLDINGS RE/63			MOLLER PIETER WILLEM 17 ROSENHEIM / BESEMBOSSTRAAT / BLOEMFONTEIN / 9301 / T: 0514211135 / C: 0829226694
ROODEWAL SMALL HOLDINGS RE/64	F00300740000006400000	SMALL HOLDINGS	PAMPHLET DISTRIBUTION PROCESS
ROODEWAL SMALL HOLDINGS RE/65	F00300740000006500000	SMALL HOLDINGS	PAMPHLET DISTRIBUTION PROCESS
ROODEWAL SMALL HOLDINGS RE/66	F00300740000006600000	SMALL HOLDINGS	PAMPHLET DISTRIBUTION PROCESS
ROODEWAL SMALL HOLDINGS RE/67	F00300740000006700000	SMALL HOLDINGS	PAMPHLET DISTRIBUTION PROCESS
ROODEWAL SMALL HOLDINGS RE/68	F00300740000006800000	SMALL HOLDINGS	PAMPHLET DISTRIBUTION PROCESS
ROODEWAL SMALL HOLDINGS RE/69	F00300740000006900000	SMALL HOLDINGS	PAMPHLET DISTRIBUTION PROCESS
ROODEWAL SMALL HOLDINGS RE/70	F00300740000007000000	SMALL HOLDINGS	PAMPHLET DISTRIBUTION PROCESS
ROODEWAL SMALL HOLDINGS 1/70	F00300740000007000001	SMALL HOLDINGS	PAMPHLET DISTRIBUTION PROCESS
ROODEWAL SMALL HOLDINGS 2/70	F00300740000007000002	SMALL HOLDINGS	PAMPHLET DISTRIBUTION PROCESS
ROODEWAL SMALL HOLDINGS 3/70	F00300740000007000003	SMALL HOLDINGS	PAMPHLET DISTRIBUTION PROCESS
ROODEWAL SMALL	F00300740000007100000	SMALL HOLDINGS	PAMPHLET DISTRIBUTION PROCESS

TABLE 1: PROPERTY DESCRIPTION AND LAND USE ZONING OF PROPERTIES ASSOCIATED WITH THE PROPOSED PIPELINE CONSTRUCTION ACTIVITIES, AS WELL AS PROPERTIES ADJACENT			
PROPERTY DESCRIPTION	**SG NUMBER**	**LAND USE ZONING**	**MANNER OF NOTIFICATION**
HOLDINGS RE/71			
ROODEWAL SMALL HOLDINGS 1/71	F00300740000007100001	SMALL HOLDINGS	PAMPHLET DISTRIBUTION PROCESS
ROODEWAL SMALL HOLDINGS 2/71	F00300740000007100002	SMALL HOLDINGS	PAMPHLET DISTRIBUTION PROCESS
ROODEWAL SMALL HOLDINGS 3/71	F00300740000007100003	SMALL HOLDINGS	PAMPHLET DISTRIBUTION PROCESS
ROODEWAL SMALL HOLDINGS RE/72	F00300740000007200000	SMALL HOLDINGS	PAMPHLET DISTRIBUTION PROCESS
ROODEWAL SMALL HOLDINGS RE/73	F00300740000007300000	SMALL HOLDINGS	PAMPHLET DISTRIBUTION PROCESS
ROODEWAL SMALL HOLDINGS RE/74	F00300740000007400000	SMALL HOLDINGS	PAMPHLET DISTRIBUTION PROCESS
ROODEWAL SMALL HOLDINGS RE/75	F00300740000007500000	SMALL HOLDINGS	PAMPHLET DISTRIBUTION PROCESS
ROODEWAL SMALL HOLDINGS RE/76	F00300740000007600000	SMALL HOLDINGS	PAMPHLET DISTRIBUTION PROCESS
ROODEWAL SMALL HOLDINGS RE/77	F00300740000007700000	SMALL HOLDINGS	PAMPHLET DISTRIBUTION PROCESS
ROODEWAL SMALL HOLDINGS RE/78	F00300740000007800000	SMALL HOLDINGS	PAMPHLET DISTRIBUTION PROCESS
ROODEWAL SMALL HOLDINGS RE/79	F00300740000007900000	SMALL HOLDINGS	PAMPHLET DISTRIBUTION PROCESS
ROODEWAL SMALL HOLDINGS RE/80	F00300740000008000000	SMALL HOLDINGS	PAMPHLET DISTRIBUTION PROCESS
ROODEWAL SMALL	F00300740000008100000	SMALL HOLDINGS	PAMPHLET DISTRIBUTION PROCESS

TABLE 1: PROPERTY DESCRIPTION AND LAND USE ZONING OF PROPERTIES ASSOCIATED WITH THE PROPOSED PIPELINE CONSTRUCTION ACTIVITIES, AS WELL AS PROPERTIES ADJACENT			
PROPERTY DESCRIPTION	**SG NUMBER**	**LAND USE ZONING**	**MANNER OF NOTIFICATION**
HOLDINGS RE/81			
ROODEWAL SMALL HOLDINGS RE/82	F00300740000008200000	SMALL HOLDINGS	PAMPHLET DISTRIBUTION PROCESS
ROODEWAL SMALL HOLDINGS RE/83	F00300740000008300000	SMALL HOLDINGS	PAMPHLET DISTRIBUTION PROCESS
ROODEWAL SMALL HOLDINGS RE/84	F00300740000008400000	SMALL HOLDINGS	PAMPHLET DISTRIBUTION PROCESS
ROODEWAL SMALL HOLDINGS 1/84	F00300740000008400001	SMALL HOLDINGS	PAMPHLET DISTRIBUTION PROCESS
ROODEWAL SMALL HOLDINGS 2/84	F00300740000008400002	SMALL HOLDINGS	PAMPHLET DISTRIBUTION PROCESS
ROODEWAL SMALL HOLDINGS 3/84	F00300740000008400003	SMALL HOLDINGS	PAMPHLET DISTRIBUTION PROCESS
ROODEWAL SMALL HOLDINGS RE/85	F00300740000008500000	SMALL HOLDINGS	PAMPHLET DISTRIBUTION PROCESS
ROODEWAL SMALL HOLDINGS 1/85	F00300740000008500001	SMALL HOLDINGS	PAMPHLET DISTRIBUTION PROCESS
ROODEWAL SMALL HOLDINGS RE/86	F00300740000008600000	SMALL HOLDINGS	PAMPHLET DISTRIBUTION PROCESS
ROODEWAL SMALL HOLDINGS RE/87	F00300740000008700000	SMALL HOLDINGS	PAMPHLET DISTRIBUTION PROCESS
ROODEWAL SMALL HOLDINGS RE/88	F00300740000008800000	SMALL HOLDINGS	PAMPHLET DISTRIBUTION PROCESS
ROODEWAL SMALL HOLDINGS RE/89	F00300740000008900000	SMALL HOLDINGS	PAMPHLET DISTRIBUTION PROCESS
ROODEWAL SMALL	F00300740000009000000	SMALL HOLDINGS	PAMPHLET DISTRIBUTION PROCESS

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PROPERTY DESCRIPTION	**SG NUMBER**	**LAND USE ZONING**	**MANNER OF NOTIFICATION**
HOLDINGS RE/90			
ROODEWAL SMALL HOLDINGS RE/106	F00300740000010600000	SMALL HOLDINGS	PAMPHLET DISTRIBUTION PROCESS
ROODEWAL SMALL HOLDINGS 1/106	F00300740000010600001	SMALL HOLDINGS	PAMPHLET DISTRIBUTION PROCESS
ROODEWAL SMALL HOLDINGS RE/107	F00300740000010700000	SMALL HOLDINGS	PAMPHLET DISTRIBUTION PROCESS
ROODEWAL SMALL HOLDINGS RE/108	F00300740000010800000	SMALL HOLDINGS	PAMPHLET DISTRIBUTION PROCESS
ROODEWAL SMALL HOLDINGS RE/109	F00300740000010900000	SMALL HOLDINGS	PAMPHLET DISTRIBUTION PROCESS
ROODEWAL SMALL HOLDINGS RE/110	F00300740000011000000	SMALL HOLDINGS	PAMPHLET DISTRIBUTION PROCESS
ROODEWAL SMALL HOLDINGS 1/110	F00300740000011000001	SMALL HOLDINGS	PAMPHLET DISTRIBUTION PROCESS
ROODEWAL SMALL HOLDINGS 2/110	F00300740000011000002	SMALL HOLDINGS	PAMPHLET DISTRIBUTION PROCESS
ROODEWAL SMALL HOLDINGS 3/110	F00300740000011000003	SMALL HOLDINGS	PAMPHLET DISTRIBUTION PROCESS
ROODEWAL SMALL HOLDINGS RE/111	F00300740000011100000	SMALL HOLDINGS	PAMPHLET DISTRIBUTION PROCESS
ROODEWAL SMALL HOLDINGS RE/112	F00300740000011200000	SMALL HOLDINGS	PAMPHLET DISTRIBUTION PROCESS
ROODEWAL SMALL HOLDINGS RE/166	F00300740000016600000	SMALL HOLDINGS	PAMPHLET DISTRIBUTION PROCESS

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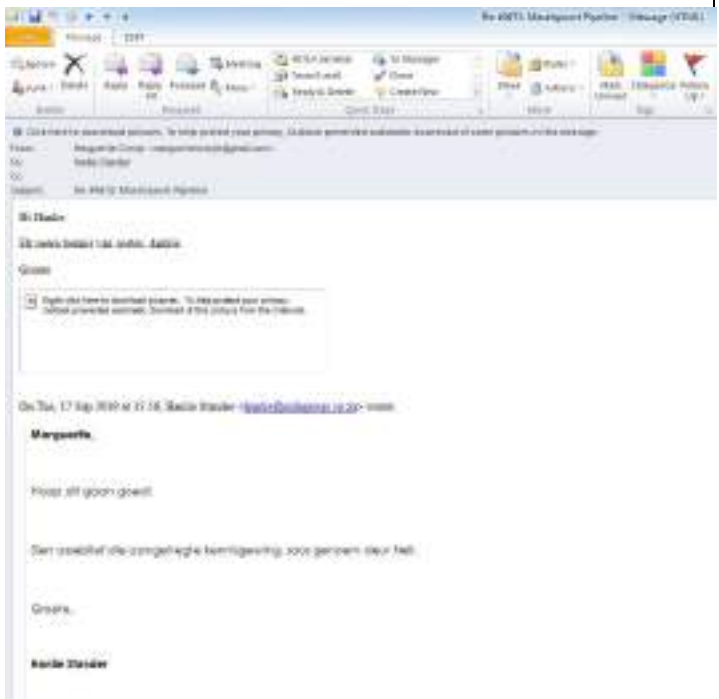
PROPERTY DESCRIPTION	**SG NUMBER**	**LAND USE ZONING**	**MANNER OF NOTIFICATION**
ROODEWAL SMALL HOLDINGS 1/166	F00300740000016600001	SMALL HOLDINGS	REGISTERED POST & E-MAIL MARGUERITE CRONJE / P.O. BOX 29729 / DANHOF / 9310 / C: 082 702 0547 
ROODEWAL SMALL HOLDINGS 2/166	F00300740000016600002	SMALL HOLDINGS	PAMPHLET DISTRIBUTION PROCESS
ROODEWAL SMALL	F00300740000016700000	SMALL HOLDINGS	PAMPHLET DISTRIBUTION PROCESS

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PROPERTY DESCRIPTION	**SG NUMBER**	**LAND USE ZONING**	**MANNER OF NOTIFICATION**
HOLDINGS RE/167			
ROODEWAL SMALL HOLDINGS RE/175	F00300740000017500000	SMALL HOLDINGS	PAMPHLET DISTRIBUTION PROCESS
ROODEWAL SMALL HOLDINGS 1/175	F00300740000017500001	SMALL HOLDINGS	PAMPHLET DISTRIBUTION PROCESS
ROODEWAL SMALL HOLDINGS 2/175	F00300740000017500002	SMALL HOLDINGS	PAMPHLET DISTRIBUTION PROCESS
ROODEWAL SMALL HOLDINGS 3/175	F00300740000017500003	SMALL HOLDINGS	PAMPHLET DISTRIBUTION PROCESS
ROODEWAL SMALL HOLDINGS 4/175	F00300740000017500004	SMALL HOLDINGS	PAMPHLET DISTRIBUTION PROCESS
ROODEWAL SMALL HOLDINGS 5/175	F00300740000017500005	SMALL HOLDINGS	ACCORDING TO THE DEED'S OFFICE, THIS HOLDING AREA OR HOLDING NUMBER OR HOLDING PORTION DOES NOT EXIST.
ROODEWAL SMALL HOLDINGS 5/176	F00300740000017600005	SMALL HOLDINGS	PAMPHLET DISTRIBUTION PROCESS
ROODEWAL SMALL HOLDINGS 6/176	F00300740000017600006	SMALL HOLDINGS	REGISTERED POST & E-MAIL BATAUNG FAMILY TRUST BATAUNG FAMILY TRUST / MR N MALEFANE / PO BOX 23538 / KAGISANONG / 9323 / NEO@LEANOSOLUTIONS.CO.ZA / T: 0514417221 / C: 0722506211 / C: 0824240875 / F: 0865182028

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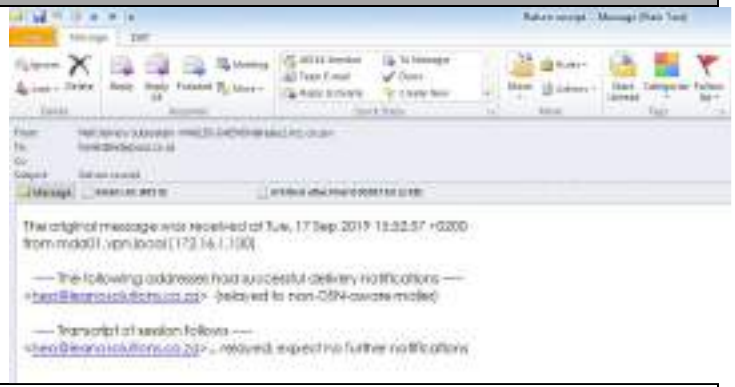
PROPERTY DESCRIPTION	**SG NUMBER**	**LAND USE ZONING**	**MANNER OF NOTIFICATION**
			
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REMAINDER OF THE FARM MAZELSPOORT 8	F00300000000000800004	AGRICULTURAL	REGISTERED POST & E-MAIL ALETTA JOHANNA DOMAN MR VAN RENSBURG / ON BEHALF OF MS ALETTA DOMAN / VAN RENSBURG ADVISORY SERVICES / 34 HIPPOCRENE STREET / BLOEMFONTEIN / 9301 / ALETTADOMAN@GMAIL.COM / T: 051 441 7942

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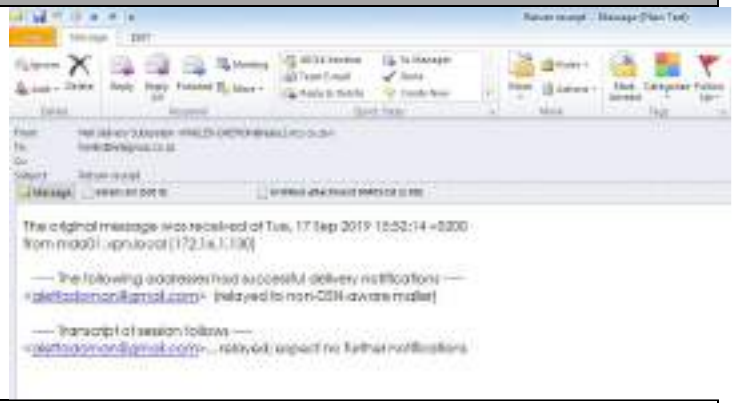
PROPERTY DESCRIPTION	**SG NUMBER**	**LAND USE ZONING**	**MANNER OF NOTIFICATION**
			
REMAINDER OF THE FARM ZUURFONTEIN 2022	F00300000000202200001		REGISTERED POST ZUURFONTEIN PROPERTIES ZUURFONTEIN PROPERTIES / ABSA BUILDING / 3RD FLOOR / 14 STRAND STREET / BELVILLE / CAPE TOWN / C: 0828204627 / T: 0127554040 / 0219153172
REMAINDER OF THE FARM ROODEWAL 2943	F00300000000294300000		REGISTERED POST & E-MAIL KOPANO NOKENG KOPANO NOKENG /14 MIDWAY /ROODEWAL / BLOEMFONTEIN /9326

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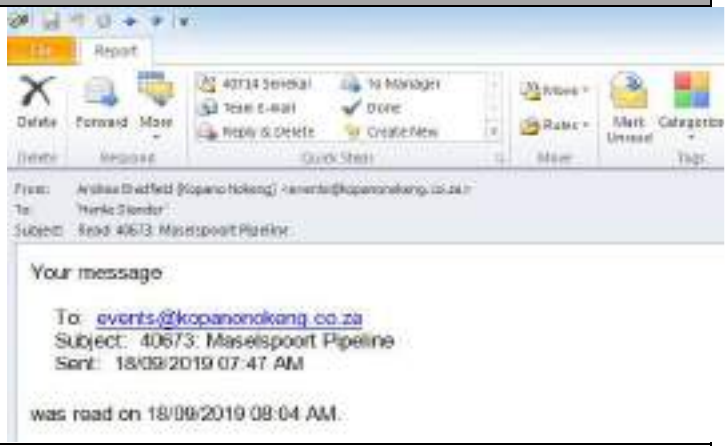
PROPERTY DESCRIPTION	**SG NUMBER**	**LAND USE ZONING**	**MANNER OF NOTIFICATION**
			
REMAINDER OF THE FARM ROODEWAL 292	F00300000000029200000	AGRICULTURAL	REGISTERED POST & E-MAIL GUSTAV BUYS GUSTAV BUYS / P.O. BOX 4079 / BLOEMFONTEIN / 9301 / C: 082 773 6785

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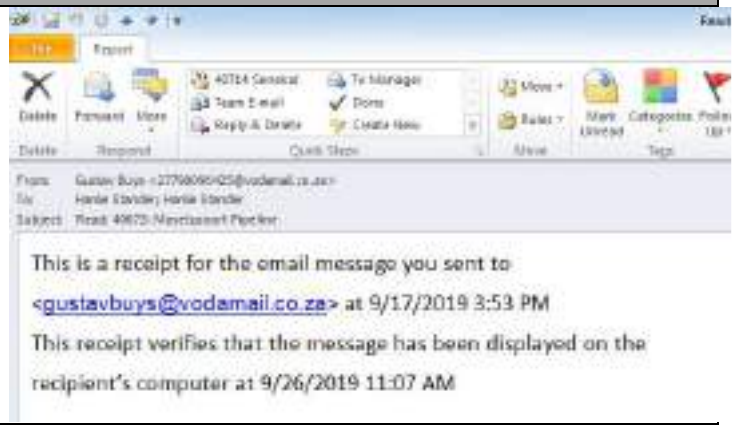
PROPERTY DESCRIPTION	**SG NUMBER**	**LAND USE ZONING**	**MANNER OF NOTIFICATION**
			 This is a receipt for the email message you sent to <gustavbuys@vodamail.co.za> at 9/17/2019 3:53 PM This receipt verifies that the message has been displayed on the recipient's computer at 9/26/2019 11:07 AM

APPENDIX B

Photographs

Figure 1: View of the environment along the Northern Pipeline alternative (Route 2). Note that the natural grassland is diminished and a vegetation structure dominated by dwarf karroid shrubs and trees have become established.

Figure 2: View of a portion of the Northern Pipeline alternative (Route 2). Large portions along this route consists of old agricultural fields dominated by weeds and pioneer herbs.

Figure 3: The vegetation along the Northern Pipeline alternative (Route 2) is evidently heavily degraded.

Figure 4: Remnant patches of the natural vegetation area however still present along the Northern Pipeline alternative (Route 2).

Figure 5: View of another remnant patch of natural vegetation along the Northern Pipeline alternative (Route 2) at the eastern border of the route.

Figure 6: View of the western portion along the Southern Pipeline alternative (Route 1). Patches of natural vegetation also remain here though the small holdings cause significant degradation of the vegetation.

Figure 7: As mentioned in Fig. 6 the natural vegetation along the western portion of the Southern Pipeline alternative (Route 1) has been significantly degraded as clearly indicated here.

Figure 7: The eastern portion along the Southern Pipeline alternative (Route 1) clearly still consists of natural grassland though its condition could not be accurately assessed due to lack of access.

Figure 8: The remaining natural vegetation along the Southern Pipeline alternative (Route 1) does however seem to more disturbed along the bordefences.

Figure 9: Tracks and signs of mammals along the pipeline routes include; on the left, numerous soil mounds of the Common Molerate (*Cryptomys hottentottus*) and on the right, scat of the Yellow Mongoose (*Cynictis penicillata*).

APPENDIX C

Facility Illustration(s)

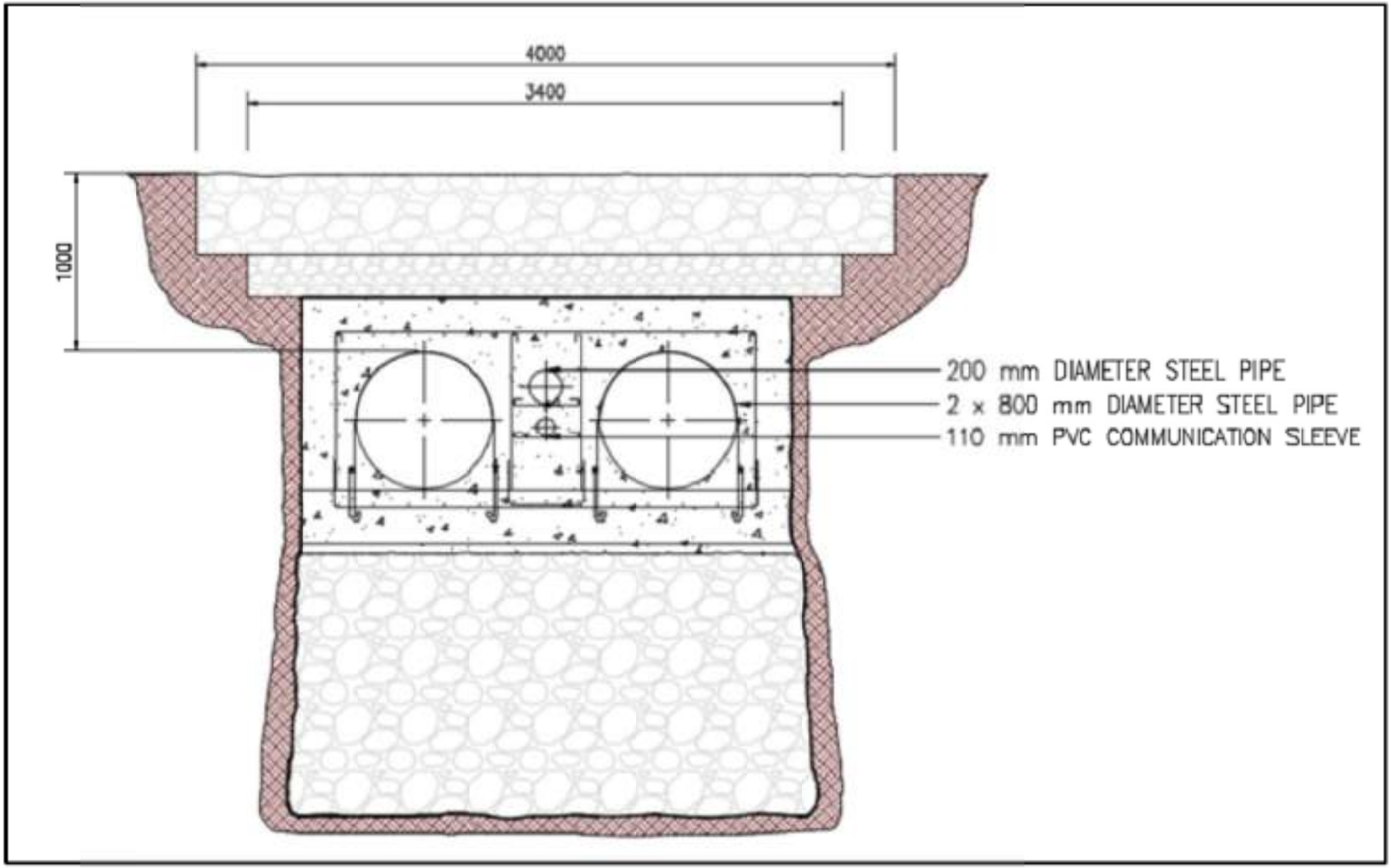
Example of a typical energy breaker system at inlets.

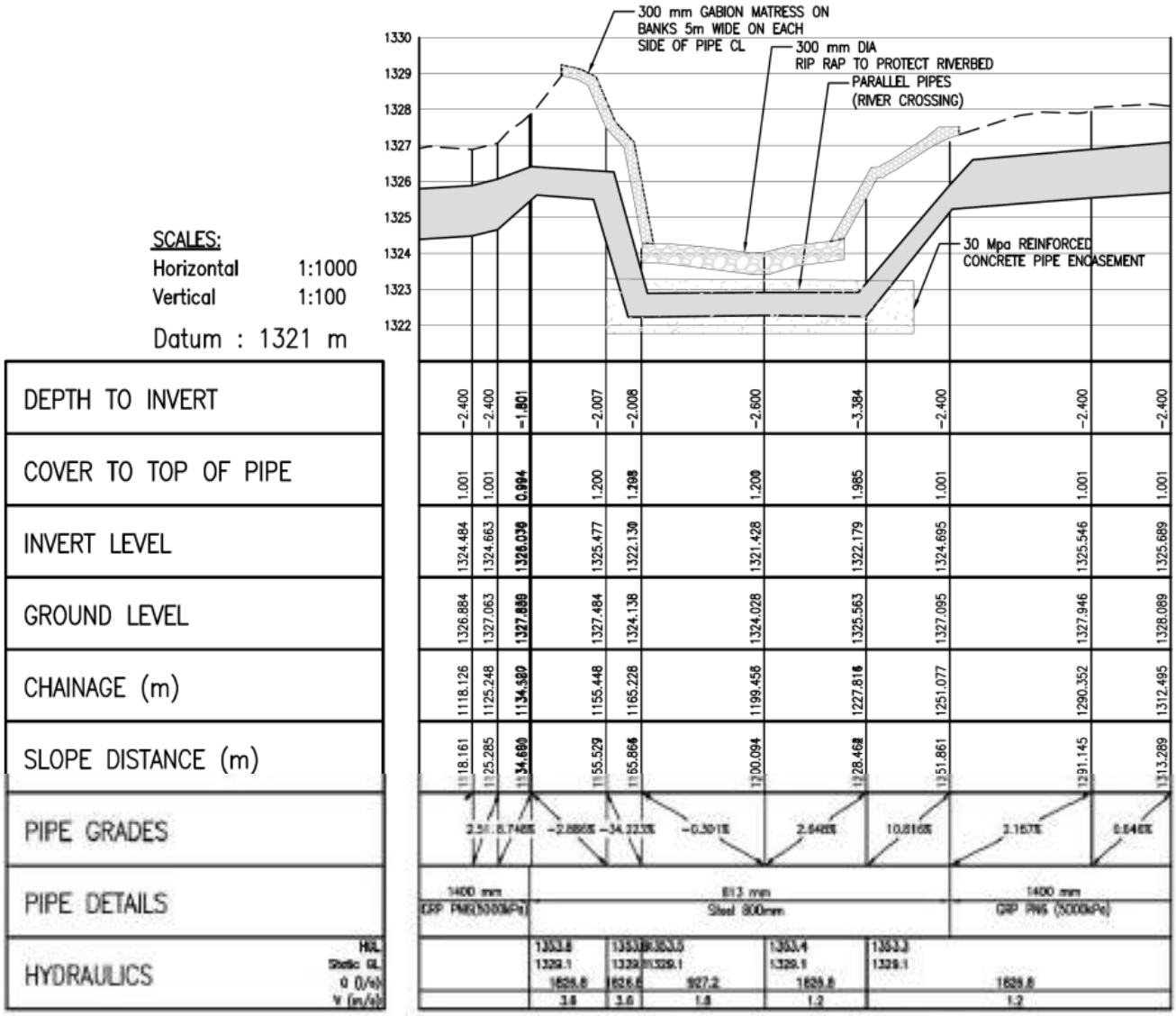
Example of the working of an energy breaker system at a pump outlet.

Example of a stream cross protection measured that will be implemented to protect the pipeline as well as to limit possible erosion.

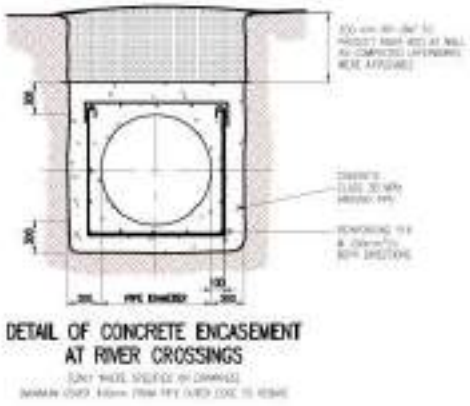
Example of the scour-pitching to be implemented where required. This is usually used to protect the environment from erosion and vegetation loss at drainage valves.

Example of a gabion constructed as part of a stream cross protection measures to be implemented


4000
3400
1000
200 mm DIAMETER STEEL PIPE
2 x 800 mm DIAMETER STEEL PIPE
110 mm PVC COMMUNICATION SLEEVE



RENOSTERSPRUIT CROSSING DETAIL
N.T.S



DETAIL OF CONCRETE ENCASEMENT AT RIVER CROSSINGS

APPENDIX D

Specialist Reports

APPENDIX D_1

Heritage Report

Phase 1 Heritage Impact Assessment of three proposed pipeline alternatives along Roodewal Midway Road between the Renosterspruit and Blesbok Avenue, Bloemfontein, Free State Province.

Report prepared by
Paleo Field Services
PO Box 38806
Langenhovenpark
9330

03 / 10 / 2019

Summary

A Phase 1 Heritage Impact Assessment was carried out for three proposed water pipeline alternatives along Roodewal Midway Road between the Renosterspruit and Blesbok Avenue in Bloemfontein, Free State Province. The proposed pipeline will function as transport for treated water to the purification plant at the Maselspoort Dam and from there back to Bloemfontein for re-use. As far as the palaeontological heritage is concerned, likelihood of palaeontological impact resulting from these linear developments is considered low for each of the three alternative routes as a result of the low topography terrain and presence of a well-developed, superficial overburden. Development for any of the three alternatives can proceed provided that all excavation activities are solely restricted to the current layout. However, any excavation exceeding depths of >1m into freshly exposed sedimentary strata (Adelaide Subgroup bedrock sediments) will require brief monitoring by a qualified palaeontologist so that any chance fossil finds can be retrieved and reported to SAHRA for further verification and mitigation. As far as the archaeological heritage is concerned, the proposed development is considered to be of low archaeological significance and is assigned a site rating of Generally Protected C. Development for any of the three alternatives can proceed with no further archaeological assessments required.

Table of Contents

Introduction

A Phase 1 Heritage Impact Assessment was carried out for three proposed water pipeline alternatives along Roodewal Midway Road between the Renosterspruit and Blesbok Avenue in Bloemfontein, Free State Province (**Fig. 1**). The proposed pipeline will function as transport for treated water to the purification plant at the Maselspoort Dam and from there back to Bloemfontein for re-use. The region's unique and non-renewable archaeological and palaeontological heritage sites are 'Generally' protected in terms of the National Heritage Resources Act (Act No 25 of 1999, section 35) and may not be disturbed at all without a permit from the relevant heritage resources authority. As many such heritage sites are threatened daily by development, both the environmental and heritage legislation require impact assessment reports that identify all heritage resources including archaeological and palaeontological sites in the area to be developed, and that make recommendations for protection or mitigation of the impact of the sites.

The primary legal trigger for identifying when heritage specialist involvement is required in the Environmental Impact Assessment process is the National Heritage Resources (NHR) Act (Act No 25 of 1999). The NHR Act requires that all heritage resources, that is, all places or objects of aesthetic, architectural, historical, scientific, social, spiritual, linguistic or technological value or significance are protected. Thus any assessment should make provision for the protection of all these heritage components, including archaeology, shipwrecks, battlefields, graves, and structures over 60 years of age, living heritage and the collection of oral histories, historical settlements, landscapes, geological sites, palaeontological sites and objects. The Act identifies what is defined as a heritage resource, the criteria for establishing its significance and lists specific activities for which a heritage specialist study may be required. In this regard, categories of development listed in Section 38 (1) of the NHR Act are:

- The construction of a road, wall, power line, pipeline, canal or other similar form of linear development or barrier exceeding 300m in length;
- The construction of a bridge or similar structure exceeding 50m in length;
- Any development or other activity which will change the character of the site

a) exceeding 5000 m² in extent; or

b) involving three or more existing erven or subdivisions thereof; or

c) involving three or more subdivisions thereof which have been consolidated within the past five years;

- The rezoning of a site exceeding 10 000 m²; or
- Any other category of development provided for in regulations by the South African Heritage Resources Agency (SAHRA).

If a heritage resource is likely to be impacted by a development listed in Section 38 (1) of the NHR Act a heritage assessment will be required either as a separate HIA or as the heritage specialist component (AIA or PIA) of an EIA.

A range of contexts can be identified which typically have high or potential cultural significance and which would require some form of heritage specialist involvement. In many cases, the nature and degree of heritage significance is largely unknown pending further investigation (e.g. capped sites, assemblages or subsurface fossil remains). On the other hand, it is also possible that a site may contain heritage resources (e.g. structures older than 60 years), with little or no conservation value.

Methodology

The archaeological significance of the affected area was evaluated through a desktop study and carried out on the basis of existing field data, database information and published literature. This was followed by a field assessment by means of a pedestrian survey. A Garmin Etrex Vista GPS hand model (set to the WGS 84 map datum) and a digital camera were used for recording purposes. Relevant archaeological information, aerial photographs and site records were consulted and integrated with data acquired during the on-site inspection.

Terms of Reference:

- Identify and map possible heritage sites and occurrences using available resources.
- Determine and assess the potential impacts of the proposed development on potential heritage resources;
- Recommend mitigation measures to minimize potential impacts associated with the proposed development.

Field Rating

Site significance classification standards as prescribed by SAHRA (2005) for archaeological sites were used for the purpose of this report (**Table 1**).

Locality data

1 : 50 000 scale topographic map: 2926 AB Maselspoort

1 : 250 000 scale geological map 2924 Bloemfontein

Alternative 1 and 2 follows the same route (red, **Fig. 2**) except for a 1.2 km diverging section indicated for Alternative 2 (green, **Fig. 2**). Alternative 3 (blue, **Fig. 2**) runs further east, but parallel to Alternative 1. The proposed routes traverse parts of the Riverside and Roodewal Small Holdings, situated east of the Renosterspruit on the Maselspoort road outside Bloemfontein (**Fig. 3**).

Routes Impact Area Coordinates:

Northwestern boundary: 29° 5'44.80"S 26°19'53.82"E

Northeastern boundary: 29° 4'20.12"S 26°21'58.73"E

Southeastern boundary: 29° 4'36.44"S 26°22'13.42"E

Southwestern boundary: 29° 5'56.19"S 26°20'13.85"E

Background

According to the 1 : 250 000 scale geological map 2924 Bloemfontein, the study area is situated within the Beaufort Group, Adelaide Subgroup (Karoo Supergroup), which is primarily represented by late Permian sedimentary rocks, made up of alternating sandstone and mudstone layers (*Pa*) associated with stream and floodplain deposits (Theron 1963; Johnson *et al.* 2006) (**Fig. 4**). Jurassic-age dolerite intrusions, in the form of sills and dykes, occur extensively around the area (*Jd*). Quaternary to recent residual deposits, comprising unconsolidated soils, alluvial sediments and sheet wash deposits, cover the underlying sedimentary rocks. The sedimentary rocks are generally accepted to be Late Permian in age and are assigned to the *Dicynodon* Assemblage Zone (Kitching 1995). The *Dicynodon* AZ is characterized by the co-occurence of two therapsids, *Dicynodon* and *Theriognathus* as well as a diversity of less dominant vertebrate taxa, while trace fossils of invertebrates and vertebrates as well as *Glossopteris* flora plants have also been described (**Fig. 5**).

The Stone Age archaeological record of the Bloemfontein region spans back to the Middle Stone Age. Prehistoric archaeological remains previously recorded in the

region include numerous occurrences of *in situ* Middle and Later Stone Age artefacts eroding out of the overbank sediments associated with the Modder River and its tributaries where they are often found in association large mammal fossil remains (Broom 1909; Churchill *et al*. 2000; Rossouw 1999, 2000, 2006). The study area is located outside the south-western periphery of distribution of Late Iron Age stone-walled settlements in the Free State (Maggs 1976).

Field Assessment

The pipeline footprint is characterized by flat, open and mostly degraded terrain (**Fig. 6 – 9)**. Except for palaeontologically insignificant dolerite exposed near the southeastern boundary of the footprint area (**Fig. 10**), no potentially sensitive Adelaide Subgroup outcrop was observed along the routes. A foot survey of the terrain revealed no evidence for the accumulation and preservation of intact fossil material within the superficial Quaternary sediments and especially within the well-developed alluvial deposits exposed along the Renosterspruit. As a result, outcrop visibility is also generally poor along the footprint. The survey revealed no evidence of *in situ* Stone Age archaeological material, capped or distributed as surface scatters on the landscape. There are also no indications of rock art (e.g. engravings on dolerite outcrop), prehistoric structures, Anglo Boer War sites, graves or buildings with historical significance older than 60 years within the boundaries of the three alternatives.

Impact Statement and Recommendation

The development footprint is underlain by potentially fossil-bearing sedimentary strata of the Late Permian Adelaide that are buffered by well-developed superficial deposits of low to very low palaeontological sensitivity.

As far as the palaeontological heritage is concerned, likelihood of palaeontological impact resulting from these linear developments is considered low for each of the three alternative routes as a result of the low topography terrain and presence of a well-developed, superficial overburden. Development for any of the three alternatives can proceed provided that all excavation activities are solely restricted to the current layout. However, any excavation exceeding depths of >1m into freshly exposed sedimentary strata (bedrock) will require brief monitoring by a qualified palaeontologist so that any chance fossil finds can be retrieved and reported to SAHRA for further verification and mitigation.

As far as the archaeological heritage is concerned, the proposed development is considered to be of low archaeological significance and is assigned a site rating of Generally Protected C. Development for any of the three alternatives can proceed with no further archaeological assessments required.

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DECLARATION OF INDEPENDENCE

I, Lloyd Rossouw, declare that I act as an independent specialist consultant. I do not have or will not have any financial interest in the undertaking of the activity other than remuneration for work as stipulated in the terms of reference. I have no interest in secondary or downstream developments as a result of the authorization of this project and have no conflicting interests in the undertaking of the activity.

03 / 10 / 2019

Tables and Figures

Table 1. Field rating categories as prescribed by SAHRA.

Field Rating	**Grade**	**Significance**	**Mitigation**
National Significance (NS)	Grade 1	-	Conservation; national site nomination
Provincial Significance (PS)	Grade 2	-	Conservation; provincial site nomination
Local Significance (LS)	Grade 3A	High significance	Conservation; mitigation not advised
Local Significance (LS)	Grade 3B	High significance	Mitigation (part of site should be retained)
Generally Protected A (GP.A)	-	High/medium significance	Mitigation before destruction
Generally Protected B (GP.B)	-	Medium significance	Recording before destruction
Generally Protected C (GP.C)	-	Low significance	Destruction

APPENDIX D_2

Ecological Report

DPR
Ecologists & Environmental Services

Report on the ecological and wetland assessment of the proposed construction of a bulk water transfer pipeline in the Roodewal Small Holdings, Bloemfontein, Free State Province.

August 2019

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DECLARATION OF INDEPENDENCE

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

Report Version	**Final 1.0**		
Title	**Report on the ecological and wetland assessment of the proposed construction of a bulk water transfer pipeline in the Roodewal Small Holdings, Bloemfontein, Free State Province.**		
Author	**DP van Rensburg (Pr.Sci.Nat)**		**Aug'19**

Executive Summary

The proposed pipeline will be constructed from the Renosterspruit, will pass through the Roodewal Small Holdings, and will join the tarred road at the north eastern border of the small holdings (Map 1). The pipeline will form part of the main water provision for the city and as such will function as transport for treated waste water to the purification plant at the Maselspoort Dam and from there back to Bloemfontein for re-use. The pipeline will cross peri-urban, transformed and natural areas, several watercourses will also be crossed by the pipeline. The assessment will include two alternative pipeline routes as well as a small additional third deviation (Map 1). Both pipeline route will have an estimated length of 5 km.

Route 1 (Southern Route)

The southern pipeline route alternative contains sections which has been modified and transformed significantly from the natural condition and these portions are consequently of relatively low conservation value. However, several large portions of relatively natural vegetation still remain, especially in the eastern section of the pipeline (Map 1). Consisting of Bloemfontein Dry Grassland, a Threatened Ecosystem, and highly likely containing protected species, these sections should be regarded as sensitive and having a significant conservation value (Map 2). The condition of the vegetation in these sections do however seem to be somewhat degraded along the border fences which should decrease the impact the proposed pipeline will have. Adequate mitigation will however be required which should include minimising the disturbance footprint and conducting a walkthrough survey to identify and mark protected species along the pipeline route. It is recommended that any protected plant specimens which will be affected by the pipeline construction should be removed and transplanted adjacent to the pipeline in an area of suitable and similar habitat. Permits must be obtained for those specimens to be transplanted.

Route 2 (Northern Route)

The vegetation along the northern pipeline route has mostly been transformed from the natural condition with only a few remnant patches of natural vegetation remaining and these also not in a good condition (Map 1). The vegetation along the route is therefore no longer considered to consist of the threatened Bloemfontein Dry Grassland (Map 2). This alternative pipeline route should therefore result in a significantly lower impact than the southern alterative. However, there is still a low likelihood of protected species occurring along the patches of remnant natural vegetation and a walkthrough survey of at least these sections should be undertaken to identify and mark protected species. Should any protected species be identified which will be affected by the pipeline construction they should be removed and transplanted adjacent to the pipeline in an area of suitable and similar habitat. Permits must be obtained for those specimens to be transplanted.

Both pipeline routes cross the same two small seasonal stream systems and these will be the subject of this study (Map 1 & 2).

From the description of the riparian vegetation of both stream systems it is clear that obligate wetland vegetation is present along both and therefore clearly indicate the presence of wetland conditions. These are more pronounced along the eastern stream, a much larger system. Exotic vegetation indicate varying degrees of disturbance at all points of crossing although in

both instances the crossings along the northern pipeline route is indicative of more disturbances than the crossings along the southern pipeline route.

The small seasonal stream systems which will be affected by the pipeline is still natural to some extent but has been significantly modified by several impacts which is mostly associated with the surrounding small holding land uses and infrastructure such as roads. An Index of Habitat Integrity (IHI) was conducted and indicated that the watercourses have an Instream IHI of Category C: Moderately Modified and Riparian IHI of Category C/D: Moderately to Largely Modified (Appendix C).

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

The two pipeline routes will cross the two affected stream systems twice for each alternative (Map 1 & 2). This is then a total of four crossing points.
The proposed pipeline will result in several significant impacts on these watercourses. The material being transported by the pipeline being treated water, will have a negligible impact should leaks or spillages occur into watercourses. This is therefore not considered a likely impact. The installation of the pipeline will however result in the disturbance of the bed and banks of the watercourses. This in turn will promote erosion, prevent the banks from stabilising and lead to increased sedimentation of the watercourses. As a result disturbance of the banks should be kept to a minimum and erosion remediated where it occurs. Removal of vegetation should also be kept to a minimum. It is further recommended that the aboveground installation of the pipeline on pylons at crossings be done as far as possible as this will cause less disturbance. The disturbance caused by construction will also cause susceptible conditions for further establishment of exotics. It is therefore recommended that weed eradication be initiated at the crossing sites prior to construction and continued until rehabilitation of the pipeline route has been completed (Appendix B). When excavating in watercourses the upper 30 cm, or topsoil, should be removed together with the vegetation and stored as sods on the site. These should then be replaced on top of the installed pipeline. Subsoil should be used as backfilling and not as top dressing. Only removed sods and topsoil should be utilised to rehabilitate the bed and bank surface. The soil surface should also be re-instated to the virgin soil level and not depressed or elevated as this will promote erosion and cause flow barriers. After rehabilitation any excess soil or material should be removed and disposed of at a registered disposal facility. Installation of the pipeline through the watercourses should preferably be undertaken during the winter months (July to September) when baseflow will be at its lowest level.

A Risk Assessment for the proposed pipeline and crossing of watercourses has been undertaken according to the Department of Water & Sanitation's requirements for risk assessment and the provisional Risk Assessment Matrix for Section 21(c) & (i) water use (Appendix D). The excavation of trenches and removal of riparian vegetation is considered to have a moderate risk in terms of the watercourse crossings whilst the crossing of watercourses by means of pylon construction is considered to be of lower risk as the footprint and disturbance of watercourses will be lower.

Table of contents

Ecological and wetlands assessment

1. Introduction

1.1 Background

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

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

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

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

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

The proposed pipeline will be constructed from the Renosterspruit, will pass through the Roodewal Small Holdings, and will join the tarred road at the north eastern border of the small holdings (Map 1). The pipeline will form part of the main water provision for the city and as such will function as transport for treated waste water to the purification plant at the Maselspoort Dam and from there back to Bloemfontein for re-use. The pipeline will cross peri-urban, transformed and natural areas, several watercourses will also be crossed by the pipeline. The assessment will include two alternative pipeline routes as well as a small additional third deviation (Map 1). Both pipeline routes will have an estimated length of 5 km.

A site visit was conducted on 27 June 2019. The route of the pipeline was surveyed by means of a drive-through and sample plots at watercourses and portions of remaining natural vegetation. The site survey was conducted during winter and consequently species identification was not easy though is still considered adequate to give a good representation of the area.

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

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

1.2 The value of biodiversity

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

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

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

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

2. Scope and limitations

- To evaluate the present state of the vegetation and ecological functioning of the area proposed for the pipeline development.
- To identify possible negative impacts that could be caused by the proposed construction of a pipeline.
- Identify and assess the watercourses being crossed by the pipeline including associated wetlands and ascertain condition and status therefore and recommend mitigation.
- Conduct a risk assessment and determine the likelihood that watercourses and wetlands will be adversely affected by the development.

2.1 Vegetation

Aspects of the vegetation that will be assessed include:

- The vegetation types of the region with their relevance to the proposed site.
- The overall status of the vegetation on site.
- Species composition with the emphasis on dominant-, rare- and endangered species.

The amount of disturbance present on the site assessed according to:

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

2.2 Fauna

Aspects of the fauna that will be assessed include:

- A basic survey of the fauna occurring in the region using visual observations of species as well as evidence of their occurrence in the region (burrows, excavations, animal tracks, etc.).
- The overall condition of the habitat.
- A list of species that may occur in the region (desktop study).

2.3 Watercourses

Aspects of the watercourses that will be assessed include:

- Identification of watercourses including rivers, streams, pans and wetlands.
- Describe condition and status of watercourses and importance relative to the larger system.
- Conduct habitat integrity assessment of perennial systems to inform the condition and status of watercourses.

2.4 Limitations

Several bulbous and herbaceous species may have finished flowering or has not yet flowered and these may have been overlooked or not identifiable.
Due to time constraints, only limited surveys of watercourses were done and concentrated on more significant watercourses.
Some animal species may not have been observed as a result of their nocturnal and/or shy habits.
Access could not be gained to large portions of the pipeline route and could therefore not be assessed directly with assessment based on estimates and nearby areas considered to be similar.
The Renosterspruit crossing was assessed during previous studies and was therefore not included in this assessment.

3. Methodology

3.1 Several literature works were used for additional information.

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

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

Terrestrial fauna:
Field guides for species identification (Child *et al* 2016, Smithers 1986a).

3.2 Survey

The site was assessed by means of transects and sample plots.

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

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

Watercourses and wetlands were identified and surveyed where they were crossed by the pipeline or occurred in close proximity to it.
These systems were delineated by use of topography (land form and drainage pattern) and riparian vegetation.
The following were used to determine and delineate the rivers, streams, pans and wetlands:

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

The following were used to determine the sensitivity or importance of these identified watercourses:

- Nel, J.L., Murray, K.M., Maherry, A.M., Petersen, C.P., Roux, D.J., Driver, A., Hill, L., Van Deventer, H., Funke, N., Swartz, E.R., Smith-Adao, L.B., Mbona, N., Downsborough, L. and Nienaber, S. (2011). Technical Report for the National Freshwater Ecosystem Priority Areas project. WRC Report No. K5/1801.

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

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

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

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

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

3.3 Criteria used to assess sites

Several criteria were used to assess the site and determine the overall status of the environment.

3.3.1 Vegetation characteristics

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

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

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

Ecological function: All plant communities play a role in the ecosystem. The ecological importance of all areas though, can vary significantly e.g. wetlands, drainage lines, ecotones, etc.

Scoring: Ecological function critical for greater system – 1, Ecological function of medium importance – 2, No special ecological function (system will not fail if absent) – 3.

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

3.3.2 Vegetation condition

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

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

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

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

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

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

3.3.3 Faunal characteristics

Presence of rare and endangered species: The actual occurrence or potential occurrence of rare or endangered species on a proposed site plays a large role on the feasibility of a development. Depending on the status and provincial conservation policy, presence of a Red Data species or very unique and sensitive habitats can potentially be a fatal flaw.
Scoring: Occurrence actual or highly likely – 1, Occurrence possible – 2, Occurrence highly unlikely.

3.4 Biodiversity sensitivity rating (BSR)

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

Table 1: Biodiversity sensitivity ranking

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

4. Ecological and wetland assessment

4.1 Ecology and description of environment

According to Mucina & Rutherford (2006) the area consists of Bloemfontein Dry Grassland (Gh 5). Bloemfontein Dry Grassland is listed as a Threatened Ecosystem with a status of Vulnerable (VU) (National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004)) (Map 2). Large portions of this grassland has been transformed by dryland crop cultivation and urbanisation.

The pipeline routes fall within an Ecological Support Area 2, Degraded and Other categories under the Free State Province Biodiversity Management Plan (2015) (Map 3). Although these are not Critical Biodiversity Areas they still function in ecological support of natural areas. This also indicates the mostly transformed nature of the area along which the proposed pipeline routes are situated.

The proposed pipeline will be constructed from the Renosterspruit, will pass through the Roodewal Small Holdings, and will join the tarred road at the north eastern border of the small holdings (Map 1). The pipeline will form part of the main water provision for the city and as such will function as transport for treated waste water to the purification plant at the Maselspoort Dam and from there back to Bloemfontein for re-use. The pipeline will cross peri-urban, transformed and natural areas, several watercourses will also be crossed by the pipeline. The assessment will include two alternative pipeline routes as well as a small additional third deviation (Map 1). Both pipeline routes will have an estimated length of 5 km.

In order to provide a more detailed description of the respective pipeline routes so that their conditions can be better assessed the two different main routes will be assessed separately from here on in the report.

Route 1 (Southern Route)

The southern route is dominated by undulating terrain with a substantially higher degree of remaining natural vegetation present. The route will cross the tarred Maselspoort road and will mostly avoid roads, being situated along the border of small holdings. Several large natural areas occur to the south of the pipeline route (Map 1 & 2).

The western portion of this route is located within the small holdings and although portions of natural vegetation remain they have been degraded to such an extent as not being good representative samples of the natural vegetation type. The small holdings entail intensive stock farming, crop cultivation and general disturbance associated with small-scale farming activities. The eastern portion of this route also contains extensive disturbance but also large areas of comparative natural grassland. Here the pipeline route exits the small holdings and is bordered to the south by extensive natural areas but to the north by small holdings (Map 1). A large historical borrow pit is situated along the pipeline route and is therefore a transformed portion. The eastern portion bordering the pipeline route to the south is however still largely natural and is confirmed by available spatial data indicating it is still forming part of the Bloemfontein Dry Grassland, a Threatened Ecosystem (Map 2).

The following description of the terrestrial vegetation along this pipeline route should also give a good indication of the condition it is in. Naturally this area should consist of Bloemfontein Dry

Grassland, a vegetation type characterised by a dominant grass layer, often dominated by the climax grass, *Themeda triandra*, but also a prominent dwarf shrub component with a diversity of geophytic species. The western portion of this pipeline route situated in the small holdings has however been altered to a significant extent. The grass layer has been much diminished and dwarf karroid shrubs are dominant in many areas. Dominant dwarf shrubs include *Lycium horridum, Pentzia incana, Rosenia humilis, Felicia muricata* and *Chrysocoma* ciliata. Where a grass layer is still present these are often dominated by pioneer species such as *Chloris virgata, Eragrostis lehmanniana* and *Aristida congesta*. However, there are still areas containing patches of climax *Themeda triandra*, which indicates that remnants of the natural vegetation type is still present and it is highly likely that protected species of conservation value will still be present here.

As mentioned the eastern section of this pipeline route is situated in an area consisting of natural vegetation. Access to this section could however not be provided and only limited sampling was undertaken here. From this sampling the following assumptions could be made. The area consists of a dominant grass layer with the climax grass, *Themeda triandra* dominating and thus indicating that the vegetation is still largely natural. Patches of dwarf karroid shrubs are still present but not prominent and therefore further substantiate that the vegetation is still largely natural. A few geophytic species were also observed, including *Eriospermum porphyrium* and *Colchicum longipes*. It is therefore also highly likely that protected species may occur along this section. It was however also noted that the border between the small holdings and natural areas to the south contained significant levels of disturbance most likely as a result of the edge effect often present along borders between degraded and natural areas. The impact that the pipeline will have should therefore be limited as long as the disturbance footprint is kept to a minimum and confined to the small strip along the border fence. As a result of disturbance several pioneer herbaceous species are prominent along the border and include *Salvia verbenaca, Senecio consanguineus, Arctotis arctotheca, Chenopodium album* as well as the exotic weed, *Alternanthera pungens*. An old borrow pit also occurs in the eastern section of the pipeline route which is consequently associated with significant transformation of the natural vegetation. Here dolerite outcrops are also abundant and as a result several tree species have also established here including *Vachellia karroo, Searsia lancea* as well as an exotic invasive tree, *Melia azedarach.*

In conclusion, the southern pipeline route alternative contains sections which has been modified and transformed significantly from the natural condition and these portions are consequently of relatively low conservation value. However, several large portions of relatively natural vegetation still remain, especially in the eastern section of the pipeline. Consisting of Bloemfontein Dry Grassland, a Threatened Ecosystem, and highly likely containing protected species, these sections should be regarded as sensitive and having a significant conservation value (Map 1 & 2). The condition of the vegetation in these sections do however seem to be somewhat degraded along the border fences which should decrease the impact the proposed pipeline will have. Adequate mitigation will however be required which should include minimising the disturbance footprint and conducting a walkthrough survey to identify and mark protected species along the pipeline route. It is recommended that any protected plant specimens which will be affected by the pipeline construction should be removed and transplanting adjacent to the pipeline in an area of suitable and similar habitat. Permits must be obtained for those specimens to be transplanted.

Route 2 (Northern Route)

The northern route is dominated by undulating terrain with most of the natural vegetation having been transformed previously or in a quite degraded condition (Map 1). Remnant patches of natural vegetation are present but overall not in a good condition. The route will be situated to the north of the tarred Maselspoort road and will also be mostly situated adjacent to an existing gravel road. This also further decreases the condition of the vegetation along the route. This pipeline route also contains a small alternative deviation but will be discussed as a whole as it does not contain any elements different from the rest of the pipeline route.

The pipeline route is situated in its entirety in the Roodewal Small Holdings and does not border on any significant natural areas (Map 1). The survey indicated that small remnants of the natural grassland are present but evidently not in a good condition. The remainder of the pipeline route has been degraded to such an extent as not being good representative samples of the natural vegetation type. The small holdings entail intensive stock farming, crop cultivation and general disturbance associated with small-scale farming activities. Spatial data also confirms that the natural vegetation type, Bloemfontein Dry Grassland, is considered transformed along this pipeline route (Map 2).

The following description of the terrestrial vegetation along this pipeline route should also give a good indication of the condition it is in. Naturally this area should consist of Bloemfontein Dry Grassland, a vegetation type characterised by a dominant grass layer, often dominated by the climax grass, *Themeda triandra*, but also a prominent dwarf shrub component with a diversity of geophytic species. This has however been altered along the majority of the pipeline route. The grass layer has been much diminished and dwarf karroid shrubs are dominant in many areas. Dominant dwarf shrubs include *Lycium horridum, Pentzia incana, Rosenia humilis, Felicia muricata, Hertia pallens, Salsola rabieana* and *Chrysocoma* ciliata. A few pioneer herbaceous species has also become prominent with *Nidorella resedifolia*, forming dominant patches in some areas. Other prominent herbaceous species also include *Senecio consanguineus* and *Osteospermum scariosum*. The small geophyte, *Moraea pallida*, is abundant. This species is unpalatable and even poisonous to stock and proliferates where overgrazing occurs as along the pipeline route. Overgrazing and disturbance of the grass layer has also resulted in the increased establishment of shrubs and trees, especially the tree, *Vachellia karroo*, and shrub, *Asparagus larcinus*. A few exotic weeds has also established due to the degraded condition and include *Datura ferox* and *Opuntia humifusa*. The latter also being a serious invasive and forms extensive clumps in this area. As mentioned, the natural grass layer is much diminished. However, the climax grass, *Themeda triandra* is still present in a few areas where remnants of the natural vegetation remain. Where a grass layer is still present these are often dominated by pioneer species such as *Chloris virgata, Eragrostis lehmanniana, Tragus koelerioides, Cynodon dactylon* and *Aristida congesta*.

In conclusion, the vegetation along the northern pipeline route has mostly been transformed from the natural condition with only a few remnant patches of natural vegetation remaining and these also not in a good condition (Map 1). The vegetation along the route is therefore no longer considered to consist of the threatened Bloemfontein Dry Grassland (Map 2). This alternative pipeline route should therefore result in a significantly lower impact than the southern alternative. However, there is still a low likelihood of protected species occurring along the patches of remnant natural vegetation and a walkthrough survey of at least these sections should be undertaken to identify and mark protected species. Should any protected species be identified which will be affected by the pipeline construction they should be removed

and transplanted adjacent to the pipeline in an area of suitable and similar habitat. Permits must be obtained for those specimens to be transplanted.

4.2 Description of vegetation along watercourses

This section will give a description of the riparian vegetation along the watercourses and wetlands affected by the pipeline (Map 1 & 2).

Both pipeline routes will cross the Renosterspruit near the western extreme. This point of crossing has been assessed by previous studies and has therefore not been included in this assessment.

Both pipeline routes cross the same two small seasonal stream systems and these will be the subject of this study (Map 1 & 2).

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

- Marnewecke, G. & Kotze, D. 1999. Appendix W6: Guidelines for delineation of wetland boundary and wetland zones. In: MacKay (Ed.), H. Resource directed measures for protection of water resources: wetland ecosystems. Department of Water Affairs and Forestry, Pretoria.

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

Within the western portions of both the northern and southern routes a small seasonal stream is being crossed (Map 1 & 2). The stream system is heavily degraded by numerous impacts and is not in a good condition. The point of crossing along the northern route could be assessed directly but access to the southern point of crossing was not possible and was surveyed a short distance upstream. Vegetation at both points will be discussed together and differences indicated where observed. The stream contains a dense grass layer in the main channel and is dominated by the riparian grass, *Cynodon dactylon*. It is however not a good indicator of wetland conditions. Clumps of the obligate wetland grass, *Diplachne fusca*, is however common and does reliably indicate the presence of wetland conditions in the stream. Along the banks of the stream scattered trees, *Vachellia karroo*, and shrubs, *Asparagus larcinus*, occur and are also a natural component of riparian vegetation in this region. The exotic riparian weed, *Phyla nodiflora*, is also common in the main channel. The southern point of crossing contains much fewer impacts than the northern crossing and does consequently not contain a significant infestation of exotic species. The northern crossing is however heavily degraded and numerous exotic weeds and invasives occur which include *Sphaeralcea bonariensis, Plantago lanceolata, Malva parviflora, Argemone ochroleuca, Bidens bipinnata, Pyracantha angustifolia, Opuntia humifusa* and *Alternanthera pungens*.

The eastern portions of both the northern and southern pipeline routes contain a larger but still seasonal stream system which is again crossed by both routes (Map 1 & 2). The stream is also considered affected by several impacts though somewhat less than the western stream. Again, the point of crossing along the northern route could be assessed directly but access to the southern point of crossing was not possible and was surveyed a short distance downstream. Vegetation at both points will be discussed together and differences indicated where observed. A dense grass cover is again present in the main channel. The riparian grass, *Cynodon dactylon* is also present but to a lesser extent and the obligate wetland grass species, *Diplachne fusca* is more abundant along this stream. Due to the larger size of the stream, pools and areas of higher moisture regime are present and are able to sustain more wetland species which include *Eleocharis sp., Setaria sphacelata, Persicaria lapathifolia* and *Cyperus longus*. These therefore indicate clear and extensive wetland conditions along this stream system. Along the banks of the stream scattered trees, *Vachellia karroo*, and shrubs, *Asparagus larcinus*, occur and are also a natural component of riparian vegetation in this region. Other herbaceous species occurring in the floodplain of the stream include *Moraea pallida, Indigofera daleoides, Scabiosa columbaria, Falkia oblonga* and *Cymbopogon pospischillii*. Both points of survey contained an existing road crossing which degrades the stream and riparian vegetation although the southern point of crossing (which could not be directly assessed) does not contain a road crossing and it is anticipated to be in a much better condition with few or no exotic species. Exotic weeds and invasive species observed included *Verbena bonariensis, Plantago lanceolata, Phyla nodiflora, Sphaeralcea bonariensis* and *Gleditsia triacanthos*.

From the description of the riparian vegetation of both stream systems it is clear that obligate wetland vegetation is present along both and therefore clearly indicate the presence of wetland conditions. These are more pronounced along the eastern stream, a much larger system. Exotic vegetation indicate varying degrees of disturbance at all points of crossing although in both instances the crossings along the northern pipeline route is indicative of more disturbances than the crossings along the southern pipeline route.

4.3 Assessment of watercourses

Watercourses being crossed by the pipeline will be discussed below (Map 1 & 2).

Both the northern and southern pipeline routes will both cross two small seasonal stream systems. Both stream systems drain into the Renosterspruit, in close proximity to each other, are mostly affected by the same impacts, are similar in their morphology and function and will affect the same downstream section. They will therefore be mostly be discussed as a whole and differences discussed where applicable.

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

Watercourse means:

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

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

The classification of stream orders from 1 to 3 can be illustrated by means of the Strahler 1952 classification:

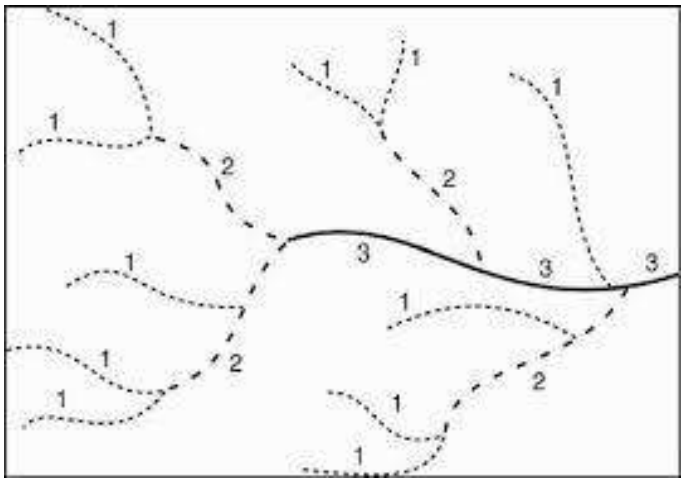


Figure 1: The classification of stream orders from 1 to 3 (Strahler 1952)

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

The marginal zone is the lowest zone and is always present in river systems while the other two zones may not always be present. The zone is situated from the water level at low flow, if present, up to the features that are hydrologically activated for the most of the year (Figure 2). The marginal zone is natural in terms of geomorphology and riparian vegetation, except for the western crossing of the northern pipeline route. Erosion is significant at all crossings and is a consequence of the surrounding land use. Refuse and litter is also present at all crossings. The flow and flooding regime would still be natural although modified to a significant degree, mostly be obstruction such as roads and infrastructure but also due to the surrounding land uses.

The lower zone is characterised by seasonal features and extends from the marginal zone up to an area of marked elevation. This area may be accompanied by a change in species distribution patterns. The lower zone consists of geomorphic features that are activated on a seasonal basis (Figure 2). The lower zone of both streams contains a gradual but still steep slope and is subjected to annual flooding. This zone is also natural though significantly modified.

The upper zone is characterised by ephemeral features as well as the presence of both riparian and terrestrial species. The zone extends from the lower zone to the riparian corridor. The upper zone contains geomorphic features that are hydrologically activated on an ephemeral basis (Figure 2). The upper zone of both streams levels off and contains a gradual slope. It is flooded very infrequently and is dominated by a short grass layer with scattered trees and shrubs but all being terrestrial species.

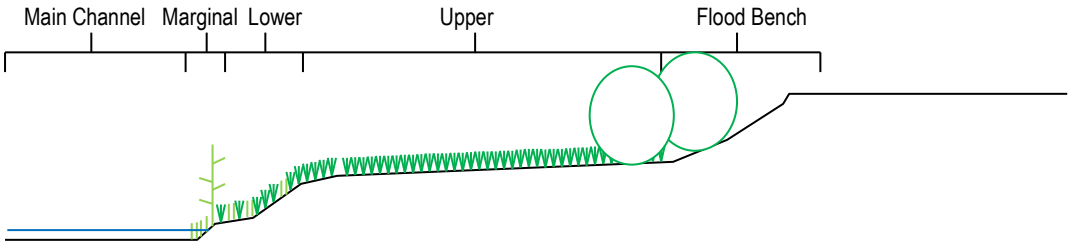


Figure 2: Illustration showing the different riparian zones of the two stream systems being crossed by the northern and southern pipeline alternatives.

Table 2 refers to the determination and categorisation of the Present Ecological State (PES; health or integrity) of various biophysical attributes of rivers relative to the natural or close to the natural reference condition. The purpose of the EcoClassification process is to gain insights and understanding into the causes and sources of the deviation of the PES of biophysical attributes from the reference condition. This provides the information needed to derive desirable and attainable future ecological objectives for the river (Kleynhans & Louw 2007).

Table 3 refers to the Ecological Importance and Sensitivity (EIS) of wetlands. "Ecological importance" of a water resource is an expression of its importance to the maintenance of ecological diversity and functioning on local and wider scales. "Ecological sensitivity" refers to the system's ability to resist disturbance and its capability to recover from disturbance once it has occurred. The Ecological Importance and Sensitivity (EIS) provides a guideline for determination of the Ecological Management Class (EMC).

Table 2: Ecological categories for Present Ecological Status (PES).

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

Table 3: Ecological importance and sensitivity categories.

Ecological Importance and Sensitivity Category (EIS)	Range of Median	Recommended Ecological Management Class
Very High Floodplains that are considered ecologically important and sensitive on a national or even international level. The biodiversity of these floodplains is usually very sensitive to flow and habitat modifications. They play a major role in moderating the quantity and quality of water of major rivers.	>3 and <=4	A
High Floodplains that are considered to be ecologically important and sensitive. The biodiversity of these floodplains may be sensitive to flow and habitat modifications. They play a role in moderating the quantity and quality of water of major rivers.	>2 and <=3	B
Moderate Floodplains that are considered to be ecologically important and sensitive on a provincial or local scale. The biodiversity of these floodplains is not usually sensitive to flow and habitat modifications. They play a small role in moderating the quantity and quality of water of major rivers.	>1 and <=2	C
Low/marginal Floodplains that are not ecologically important and sensitive at any scale. The biodiversity of these floodplains is ubiquitous and not sensitive to flow and habitat modifications. They play an insignificant role in moderating the quantity and quality of water of major rivers.	>0 and <=1	D

The affected stream systems were delineated by use of topography (land form and drainage pattern) and riparian vegetation. The following guidelines and frameworks were used to determine and delineate the watercourses:

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

The determination of the condition of the watercourses along both pipeline alternatives will be based on an overall determination of the Index of Habitat Integrity (IHI) (Appendix C). Both stream systems drain into the Renosterspruit, in close proximity to each other, are mostly affected by the same impacts, are similar in their morphology and function and will affect the same downstream section. As a result, one IHI will be conducted to represent the overall condition of these stream systems. This is considered to give a good representation of their condition as both watercourses drain into the Renosterspruit and will affect the same downstream area. The IHI will be taken as representative of the Present Ecological State (PES) of these systems.

The small seasonal stream systems which will be affected by the pipeline is still natural to some extent but has been significantly modified by several impacts which is mostly associated with the surrounding small holding land uses and infrastructure such as roads. An Index of Habitat Integrity (IHI) was conducted and indicated that the watercourses have an Instream IHI of Category C: Moderately Modified and Riparian IHI of Category C/D: Moderately to Largely Modified (Appendix C).

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

The two pipeline routes will cross the two affected stream systems twice for each alternative. This is then a total of four crossing points. A short description of each crossing point will be provided.

Table 4: Description of the specific points of crossing by the proposed pipeline alternatives over the two small stream systems (Map 1 & 2).

Watercourse name:	**Coordinates of crossing:**	**Order:**
#1 Unnamed stream system (Route 1 – Southern Pipeline)	S 29.098819°, E 26.341101°	Second Order
Description of watercourse at point of crossing: A small seasonal stream system in the western portion of the southern pipeline route. Access to the exact point of crossing could not be provided and a point a short distance upstream was surveyed. The stream at this point is considered still natural to a significant degree. It is located within an area of small holdings and also has its origin in this area. It will therefore be affected by land use associated with these small holdings. Concentrated livestock farming will be one of the most significant impacts. This will cause trampling and overgrazing which will decrease the vegetation cover and increase erosion and sedimentation of the stream. Manure will also contribute to increased nutrients. Areas of dryland crop cultivation is also visible and this will further contribute to a decrease in vegetation cover and an increase in sediment load. Impacts associated with fertiliser, herbicide and pesticide use is also likely. There are also numerous gravel roads, dirt tracks and low water crossings over this stream which will also result in significant impacts. The main impact is the obstruction this causes to flow and flooding and will therefore alter the natural flow and flooding regime of the stream. The stream contains a clearly defined main channel although a quite extensive and not clearly defined floodplain is also present. Though small the stream clearly contains obligate wetland vegetation but mostly confined to the main channel and absent from the floodplain.		

View of the small stream with the point of survey (red) and the actual point of crossing indicated (yellow). Note the grass dominated main channel and apparent natural surroundings.

View of the culver crossing of the stream. This will clearly affect the natural flow and flooding regime of the stream.

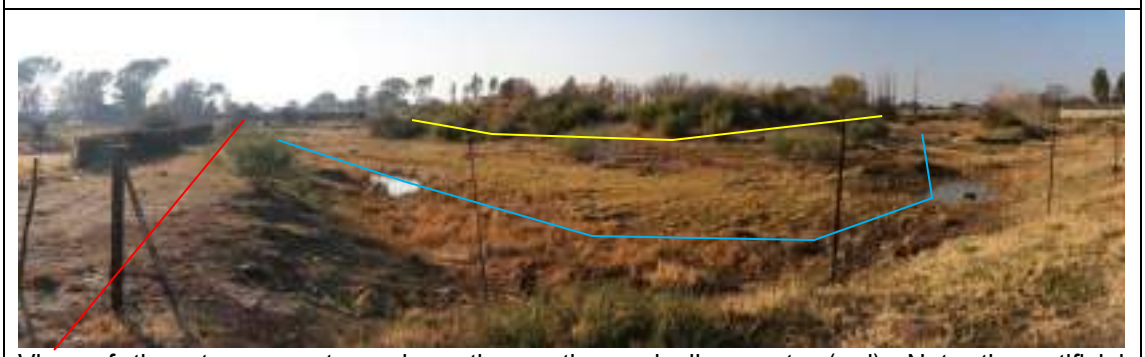
Watercourse name:	**Coordinates of crossing:**	**Order:**
#2 Unnamed stream system (Route 2 – Northern Pipeline)	S 29.094865°, E 26.337133°	Second Order

Description of watercourse at point of crossing:

This is the same stream system as discussed in Crossing #1 but crossed by the Northern Pipeline route. The point of crossing is located approximately 600 meters downstream of Crossing #1 and impacts here have cumulated to become much more significant.

The stream system at this point becomes much more modified then the upstream section. In addition to impacts as discussed for the same stream under Crossing #1 the stream is also affected by crossing by the tarred road, an artificial impoundment and canalisation. The stream is being crossed by the tarred Maselspoort road, a busy road, causing significant disturbance of the stream. A small artificial impoundment has also been constructed in the stream which will have a significant impact on the flow and flooding regime and geomorphology of the stream. The survey also indicated that the riparian vegetation has been significantly altered as a result. Downstream of the dam the stream is also canalised passed an orchard which significantly alters the stream further. The stream at this crossing is significantly degraded and modified.

The stream contains a clearly defined main channel but which has evidently been modified by impacts as described. The vegetation in the stream is degraded but obligate wetland vegetation is still present.



View of the stream system along the northern pipeline route (red). Note the artificial impoundment (yellow) and stream flowing from it. This area is clearly degraded and the stream heavily modified.

View of the floodplain of the stream. Note dense infestation by the exotic *Opuntia humifusa* (red).

View of the culvert at the crossing (red) with the canalised section of the stream inbetween orchards and crop fields.

Watercourse name:	Coordinates of crossing:	Order:
#3 Unnamed stream system (Route 1 – Southern Pipeline)	S 29.084928°, E 26.362107°	Second Order

Description of watercourse at point of crossing:

The small seasonal stream system in the eastern portion of the southern pipeline route. Access to the exact point of crossing could not be provided and a point 400 meters downstream was surveyed. The impacts here were much more significant than the actual point of crossing and should be taken into consideration.

The stream at this point is considered still natural to a significant degree. The majority of the stream is situated within a natural area utilised for livestock farming. The impacts on it here will therefore be limited. Livestock overgrazing will however contribute to trampling which will decrease the vegetation cover and increase erosion and sedimentation of the stream. Manure will also contribute to increased nutrients. A small portion of dryland cropfileds also occurs in the catchment of the stream which will have some impact associated with fertiliser, herbicide and pesticide use. The impacts on the stream are however limited and should indicate that it is in a relatively good condition at this point of crossing.

The stream contains a clearly defined main channel although a quite extensive and not clearly defined floodplain is also present. The stream is significant and contains a prominent obligate wetland vegetation component although mostly confined to the main channel.

View of the stream with the actual point of crossing indicated (red). Note the largely natural surroundings.

Another view of the stream with the actual point of crossing indicated (red). Again note the comparative natural condition of the stream.

Watercourse name:	Coordinates of crossing:	Order:
#4 Unnamed stream system (Route 2 – Northern Pipeline)	S 29.082766°, E 26.353049°	Second Order

Description of watercourse at point of crossing:

This is the same stream system as discussed in Crossing #3. The point of crossing is located approximately 1 km downstream of Crossing #3 and impacts here have cumulated to become more significant, decreasing the condition of the stream in comparison to Crossing #3.

The stream system at this point becomes more modified though not significantly different than the upstream section. Additional impacts at this crossing point include crossing by the tarred road and a small artificial impoundment. The stream is being crossed by the tarred Maselspoort road, a busy road, causing significant disturbance of the stream. A small artificial impoundment has also been constructed in the stream which will have a significant impact on the flow and flooding regime and geomorphology of the stream. The stream at this crossing is therefore decreased in condition though only considered moderately modified.

The stream contains a clearly defined main channel although a quite extensive and not clearly defined floodplain is also present. The stream is significant and contains a prominent obligate wetland vegetation component although mostly confined to the main channel.

View of the stream downstream of the point of crossing. Note the relatively natural environment, though significantly modified by surrounding small holdings.

View of the culvert over the stream at the point of crossing. This also contributes to modification of the flow and flooding regime and ponding upstream of the culvert.

View of the stream upstream of the point of crossing. Note clear ponding caused by the road crossing. The flood bench is also quite visible here (red).

4.4 Anticipated impacts on watercourses

The two affected small stream systems are both affected by several impacts though not considered to such an extent as to cause modification beyond a moderate level. However, it is also clear that the stream crossings along the southern pipeline route (Route 1) is in a much better condition than the stream crossing along the northern pipeline route (Route 2). As far as

the anticipated impacts of the pipeline are concerned the northern pipeline route will therefore result in a lower level of impacts and is therefore preferred over the southern route.

Impacts on the two streams are mostly associated with the surrounding small holdings, their land uses, and numerous road crossings (Map 1). The road crossings, especially the Maselspoort tarred road, act as flow barriers retarding flow and in so doing altering the flow and flooding regime. They also contribute pollutants in the form of runoff from the road surface. The Roodewal Small Holdings will also result in impacts associated with peri-urban areas including altered storm water velocity and volumes and pollutants. The small holdings are also associated with concentrated agricultural activities which will also contribute some impacts to these watercourses. Dryland and irrigated cropfields and concentrated livestock farming will result in decreased vegetation cover and consequently increased surface runoff and erosion leading to increased sediment load within watercourses. Clearing of fields to plant crops disturbs the soil surface and decreases vegetation cover which in turn increases runoff velocity and erosion which increases the sediment load within these watercourses. Together with the runoff also occurs the runoff of herbicide, pesticide and fertiliser residue and contributes pollutants and increases the nutrient level within these watercourses. Livestock farming will also decrease the vegetation layer, trampling will disturb the soil surface and increased runoff and sediment load will result. In addition, manure will increase the nutrient load within watercourses.

The proposed pipeline will result in several significant impacts on these watercourses. The material being transported by the pipeline being treated water, will have a negligible impact should leaks or spillages occur into watercourses. This is therefore not considered a likely impact. The installation of the pipeline will however result in the disturbance of the bed and banks of the watercourses. This in turn will promote erosion, prevent the banks from stabilising and lead to increased sedimentation of the watercourses. As a result disturbance of the banks should be kept to a minimum and erosion remediated where it occurs. Removal of vegetation should also be kept to a minimum. It is further recommended that the aboveground installation of the pipeline on pylons at crossings be done as far as possible as this will cause less disturbance. The disturbance caused by construction will also cause susceptible conditions for further establishment of exotics. It is therefore recommended that weed eradication be initiated at the crossing sites prior to construction and continued until rehabilitation of the pipeline route has been completed (Appendix B). When excavating in watercourses the upper 30 cm, or topsoil, should be removed together with the vegetation and stored as sods on the site. These should then be replaced on top of the installed pipeline. Subsoil should be used as backfilling and not as top dressing. Only removed sods and topsoil should be utilised to rehabilitate the bed and bank surface. The soil surface should also be re-instated to the virgin soil level and not depressed or elevated as this will promote erosion and cause flow barriers. After rehabilitation any excess soil or material should be removed and disposed of at a registered disposal facility. Installation of the pipeline through the watercourses should preferably be undertaken during the winter months (July to September) when baseflow will be at its lowest level.

4.5 Risk assessment

A Risk Assessment for the proposed pipeline and crossing of watercourses has been undertaken according to the Department of Water & Sanitation's requirements for risk assessment and the provisional Risk Assessment Matrix for Section 21(c) & (i) water use. The excavation of trenches and removal of riparian vegetation is considered to have a moderate risk in terms of the watercourse crossings whilst the crossing of watercourses by means of

pylon construction is considered to be of lower risk as the footprint and disturbance of watercourses will be lower.

Moderate Risks: Risk and impact on watercourses are notably and require mitigation measures on a higher level, which costs more and require specialist input. Licence required.

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

For the complete risk assessment please refer to Appendix D.

No.	Phases	Activity	Aspect	Impact	Risk Rating	Confidence level	Control measures
1	All Phases	Installation of bulk water transport pipeline through watercourses.	Excavation and backfilling of trenches	Excavation of trenches will impede flow while trenches are open. Disturbance of the bed and banks will promote sedimentation.	**M**	**4**	Control measures which can be utilised to decrease the risk include the following. Installation of pipelines during winter months when seasonal systems will not contain a baseflow and flow regime alteration will be minimal. Correct backfilling and using the removal of sods as rehabilitation.
			Removal of riparian vegetation	Removal of riparian vegetation will promote erosion and sedimentation of watercourses. Disturbance and removal of vegetation will create conditions susceptible to the establishment of exotic weeds.	**M**	4	Adequate rehabilitation and replacement of sods to decrease rehabilitation period. Adequate weed control to prevent establishment of weeds and promote establishment of indigenous riparian vegetation.
			Construction of pipeline pylons	Construction of pylons will cause limited disturbance of the bed and banks which will also promote erosion and sedimentation but will be less than the excavation of trenches. Removal of vegetation will be more limited than trench excavation. Pylons will form a obstruction to flow which will be low as long as pylon footprints are small.	**L**	4	Pylons will have a smaller footprint and require less disturbance of vegetation and the soil profile and will therefore entail a lower risk.

4.6 Overview of terrestrial mammals (actual & possible)

Both pipeline route alternatives are situated in a degraded habitat and consequently it is considered unlikely that this area will support a significant mammal population. Small, widespread and abundant species adapted to disturbed environments is however still likely to occur.

Signs and tracks of mammals identified along the pipeline routes included the following:

Shallow foraging excavation and a small borrow of an unidentified mammal were noted although the species could not be established.

Soil mounds of the Common Molerat (*Cryptomys hottentotus*) are abundant. This is a generalist species common in peri-urban areas and consequently not of high conservation value.

Burrows and scat of the Yellow Mongoose (*Cynictis penicillata*) also occur near the old borrow pit. This species is also widespread and common and will vacate the area once construction commences.

It is not anticipated that the pipeline development will have a high impact on the mammal population as a result of the largely altered mammal population along the majority of the pipeline routes as well as the relatively small footprint of the pipeline.

The only factor that would have a high impact on the mammal population would be the hunting, capturing and trapping of mammals. This must be strictly prohibited.

In addition, open trenches may act as pitfall traps to mammals, reptiles and amphibians and trenches should be daily monitored for trapped animals which should be removed promptly.

List of some Red Data terrestrial mammals that could occur in the region:

South African Hedgehog	*Atelerix frontalis*
Aardwolf	*Proteles cristatus*
African Wild Cat	*Felis lybica*
Small-Spotted Cat	*Felis nigripes*
Bat-Eared Fox	*Otocyon megalotis*
Striped Weasel	*Poecilogale albinucha*

5. Ecological description of affected area

Habitat diversity and species richness:

Route 1 (Southern Route)
Habitat diversity along the pipeline route is moderate. The route consists predominately of grassland with large portions still being intact and natural. The two streams also contribute significantly to habitat diversity. Due to lack of access the species diversity could not be adequately determined but is estimated as moderate.

Route 2 (Northern Route)
The route is situated entirely within the small holdings and without extensive natural areas which is therefore considered to have a relatively low habitat diversity. The two stream systems do contribute to habitat diversity but not sufficient to significantly increase this. As a result the species diversity is also considered relatively low.

Presence of rare and endangered species:

Route 1 (Southern Route)
It is considered unlikely that the route will contain any exceptionally rare or endangered species although the immediate area is known to contain several protected species and given the large portions of natural vegetation remaining along this route is highly likely to still occur here. These species include *Crinum bulbispermum, Eucomis autumnalis*, *Ammocharis coranica, Haemanthus montanus,* and *Brunsvigia radulosa.* Adequate mitigation should include conducting a walkthrough survey to identify and mark protected species along the pipeline route. It is recommended that any protected plant specimens which will be affected by the pipeline construction should be removed and transplanted adjacent to the pipeline in an area of suitable and similar habitat. Permits must be obtained for those specimens to be transplanted.

Route 2 (Northern Route)
Only small patches of natural vegetation remain along this route and the likelihood of protected species occurring is much lower. However, there is still a low likelihood of protected species occurring along the patches of remnant natural vegetation and a walkthrough survey of at least these sections should be undertaken to identify and mark protected species. Should any protected species be identified which will be affected by the pipeline construction they should be removed and transplanted adjacent to the pipeline in an area of suitable and similar habitat. Permits must be obtained for those specimens to be transplanted.

Ecological function:

Route 1 (Southern Route)
The ecological function along this route is modified to a significant degree. However, the eastern portion containing large areas of natural vegetation will be more intact than the western, transformed portion. The functioning of the small streams along this route is also much more natural both in terms of water transportation and habitat.

Route 2 (Northern Route)
The ecological function along this route has been transformed for the most part and only remnant patches of natural vegetation remain. The functioning of the two stream systems is also more modified here than along the southern route. However, the functioning of

watercourses remain highly important to the continued functioning and service provision to downstream areas and should therefore still be regarded as sensitive.

Degree of rarity/conservation value:

Route 1 (Southern Route)

According to Mucina & Rutherford (2006) the area consists of Bloemfontein Dry Grassland (Gh 5). Bloemfontein Dry Grassland is listed as a Threatened Ecosystem with a status of Vulnerable (VU) (National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004)) (Map 2). The portions of remaining natural vegetation along this route therefore has a relatively high conservation value.

The two small stream systems are also mostly intact, further increasing the conservation value.

Route 2 (Northern Route)

According to Mucina & Rutherford (2006) the area consists of Bloemfontein Dry Grassland (Gh 5). Bloemfontein Dry Grassland is listed as a Threatened Ecosystem with a status of Vulnerable (VU) (National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004)) (Map 2). The vegetation along this route is however mostly transformed and the natural vegetation type no longer present. This significantly decreases the conservation value.

The two small stream systems are also significantly more degraded along the route. In spite of this all the watercourses remain sensitive and have a significant conservation value.

Percentage ground cover:

Route 1 (Southern Route)

The percentage ground cover has been significantly modified, especially in the western portion where it is relatively low. However, the eastern, natural portion, is still considered to contain a relatively high percentage grass cover.

Route 2 (Northern Route)

Land use, especially livestock overgrazing, along this route has considerably decreased the percentage vegetation cover and is considered to be relatively low.

Vegetation structure:

Route 1 (Southern Route)

The vegetation structure is still intact in the eastern, natural grassland portion, but modified to a significant degree in the western portion.

Route 2 (Northern Route)

The vegetation structure has been significantly modified, mostly by an increase in tree and shrub establishment but is still considered to be moderately modified.

Infestation with exotic weeds and invader plants:

Route 1 (Southern Route)

A significant level of infestation by exotic weeds is present, especially along the western portion, but still regarded as only moderate.

Route 2 (Northern Route)
This route contains large patches of invasive species with exotic weeds abundant in many areas.

Degree of grazing/browsing impact:

Route 1 (Southern Route)

Overgrazing is relatively high in the western, small holdings, portion and decreases in the eastern portion where stocking levels are lower.

Route 2 (Northern Route)
This route is confined to the small holdings where overgrazing is relatively high.

Signs of erosion:

Route 1 (Southern Route)

Erosion is considered moderate. Impacts in the area decrease the vegetation cover which in turn leads to moderate levels of sheet erosion.

Route 2 (Northern Route)
Erosion is also considered moderate, though may be somewhat higher than the southern route.

Terrestrial animals:

Both pipeline route alternatives are situated in a degraded habitat and consequently it is considered unlikely that this area will support a significant mammal population. Small, widespread and abundant species adapted to disturbed environments is however still likely to occur.

Table 5: Biodiversity Sensitivity Rating for the proposed southern pipeline alternative (Route 1).

	Low (3)	Medium (2)	High (1)
Vegetation characteristics			
Habitat diversity & Species richness		2	
Presence of rare and endangered species		2	
Ecological function		2	
Uniqueness/conservation value		2	
Vegetation condition			
Percentage ground cover		2	
Vegetation structure		2	
Infestation with exotic weeds and invader plants or encroachers		2	
Degree of grazing/browsing impact		2	
Signs of erosion		2	
Terrestrial animal characteristics			
Presence of rare and endangered species	3		
Sub total	3	18	0
Total		21	

Table 6: Biodiversity Sensitivity Rating for the proposed northern pipeline route (Route 2).

	Low (3)	Medium (2)	High (1)
Vegetation characteristics			
Habitat diversity & Species richness	3		
Presence of rare and endangered species	3		
Ecological function		2	
Uniqueness/conservation value		2	
Vegetation condition			
Percentage ground cover	3		
Vegetation structure		2	
Infestation with exotic weeds and invader plants or encroachers	3		
Degree of grazing/browsing impact	3		
Signs of erosion		2	
Terrestrial animal characteristics			
Presence of rare and endangered species	3		
Sub total	18	8	0
Total		26	

6. Biodiversity sensitivity rating (BSR)

Table 7: Interpretation of Biodiversity Sensitivity Rating.

Site	Score	Site Preference Rating	Value
Southern pipeline route (Route 1)	21	Degraded	3

Table 8: Interpretation of Biodiversity Sensitivity Rating.

Site	Score	Site Preference Rating	Value
Northern pipeline route (Route 2)	26	Advanced Degraded	4

7. Discussion and conclusions

According to Mucina & Rutherford (2006) the area consists of Bloemfontein Dry Grassland (Gh 5). Bloemfontein Dry Grassland is listed as a Threatened Ecosystem with a status of Vulnerable (VU) (National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004)) (Map 2). Large portions of this grassland has been transformed by dryland crop cultivation and urbanisation.

The pipeline routes fall within an Ecological Support Area 2, Degraded and Other categories under the Free State Province Biodiversity Management Plan (2015) (Map 3). Although these are not Critical Biodiversity Areas they still function in ecological support of natural areas. This also indicates the mostly transformed nature of the area along which the proposed pipeline routes are situated.

The proposed pipeline will be constructed from the Renosterspruit, will pass through the Roodewal Small Holdings, and will join the tarred road at the north eastern border of the small holdings (Map 1). The pipeline will form part of the main water provision for the city and as such will function as transport for treated waste water to the purification plant at the Maselspoort Dam and from there back to Bloemfontein for re-use. The pipeline will cross peri-urban, transformed and natural areas, several watercourses will also be crossed by the pipeline. The assessment will include two alternative pipeline routes as well as a small additional third deviation (Map 1). Both pipeline route will have an estimated length of 5 km.

Route 1 (Southern Route)

The southern route is dominated by undulating terrain with a substantially higher degree of remaining natural vegetation present. The route will cross the tarred Maselspoort road and will mostly avoid roads, being situated along the border of small holdings. Several large natural areas occur to the south of the pipeline route (Map 1 & 2).

The southern pipeline route alternative contains sections which has been modified and transformed significantly from the natural condition and these portions are consequently of relatively low conservation value. However, several large portions of relatively natural vegetation still remain, especially in the eastern section of the pipeline (Map 1). Consisting of Bloemfontein Dry Grassland, a Threatened Ecosystem, and highly likely containing protected species, these sections should be regarded as sensitive and having a significant conservation value (Map 2). The condition of the vegetation in these sections do however seem to be somewhat degraded along the border fences which should decrease the impact the proposed pipeline will have. Adequate mitigation will however be required which should include minimising the disturbance footprint and conducting a walkthrough survey to identify and mark

protected species along the pipeline route. It is recommended that any protected plant specimens which will be affected by the pipeline construction should be removed and transplanted adjacent to the pipeline in an area of suitable and similar habitat. Permits must be obtained for those specimens to be transplanted.

Route 2 (Northern Route)

The northern route is dominated by undulating terrain with most of the natural vegetation having been transformed previously or in a quite degraded condition. Remnant patches of natural vegetation are present but overall not in a good condition. The route will be situated to the north of the tarred Maselspoort road and will also be mostly situated adjacent to an existing gravel road (Map 1). This also further decreases the condition of the vegetation along the route. This pipeline route also contains a small alternative deviation but will be discussed as a whole as it does not contain any elements different from the rest of the pipeline route.

The vegetation along the northern pipeline route has mostly been transformed from the natural condition with only a few remnant patches of natural vegetation remaining and these also not in a good condition (Map 1). The vegetation along the route is therefore no longer considered to consist of the threatened Bloemfontein Dry Grassland (Map 2). This alternative pipeline route should therefore result in a significantly lower impact than the southern alterative. However, there is still a low likelihood of protected species occurring along the patches of remnant natural vegetation and a walkthrough survey of at least these sections should be undertaken to identify and mark protected species. Should any protected species be identified which will be affected by the pipeline construction they should be removed and transplanted adjacent to the pipeline in an area of suitable and similar habitat. Permits must be obtained for those specimens to be transplanted.

Both pipeline routes will cross the Renosterspruit near the western extreme. This point of crossing has been assessed by previous studies and has therefore not been included in this assessment.

Both pipeline routes cross the same two small seasonal stream systems and these will be the subject of this study (Map 1 & 2).

From the description of the riparian vegetation of both stream systems it is clear that obligate wetland vegetation is present along both and therefore clearly indicate the presence of wetland conditions. These are more pronounced along the eastern stream, a much larger system. Exotic vegetation indicate varying degrees of disturbance at all points of crossing although in both instances the crossings along the northern pipeline route is indicative of more disturbances than the crossings along the southern pipeline route.

The determination of the condition of the watercourses along both pipeline alternatives will be based on an overall determination of the Index of Habitat Integrity (IHI) (Appendix C). Both stream systems drain into the Renosterspruit, in close proximity to each other, are mostly affected by the same impacts, are similar in their morphology and function and will affect the same downstream section. As a result, one IHI will be conducted to represent the overall condition of these stream systems. This is considered to give a good representation of their condition as both watercourses drain into the Renosterspruit and will affect the same downstream area. The IHI will be taken as representative of the Present Ecological State (PES) of these systems.

The small seasonal stream systems which will be affected by the pipeline is still natural to some extent but has been significantly modified by several impacts which is mostly associated with the surrounding small holding land uses and infrastructure such as roads. An Index of Habitat Integrity (IHI) was conducted and indicated that the watercourses have an Instream IHI of Category C: Moderately Modified and Riparian IHI of Category C/D: Moderately to Largely Modified (Appendix C).

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

The two pipeline routes will cross the two affected stream systems twice for each alternative (Map 1 & 2). This is then a total of four crossing points.

Table 9: Summary of watercourses and the position of the pipeline crossing (Map 1 & 2).

Watercourse	Position of crossing
#1 Unnamed stream system (Route 1 – Southern Pipeline)	S 29.098819°, E 26.341101°
#2 Unnamed stream system (Route 2 – Northern Pipeline)	S 29.094865°, E 26.337133°
#3 Unnamed stream system (Route 1 – Southern Pipeline)	S 29.084928°, E 26.362107°
#4 Unnamed stream system (Route 2 – Northern Pipeline)	S 29.082766°, E 26.353049°

The proposed pipeline will result in several significant impacts on these watercourses. The material being transported by the pipeline being treated water, will have a negligible impact should leaks or spillages occur into watercourses. This is therefore not considered a likely impact. The installation of the pipeline will however result in the disturbance of the bed and banks of the watercourses. This in turn will promote erosion, prevent the banks from stabilising and lead to increased sedimentation of the watercourses. As a result disturbance of the banks should be kept to a minimum and erosion remediated where it occurs. Removal of vegetation should also be kept to a minimum. It is further recommended that the aboveground installation of the pipeline on pylons at crossings be done as far as possible as this will cause less disturbance. The disturbance caused by construction will also cause susceptible conditions for further establishment of exotics. It is therefore recommended that weed eradication be initiated at the crossing sites prior to construction and continued until rehabilitation of the pipeline route has been completed (Appendix B). When excavating in watercourses the upper 30 cm, or topsoil, should be removed together with the vegetation and stored as sods on the site. These should then be replaced on top of the installed pipeline. Subsoil should be used as backfilling and not as top dressing. Only removed sods and topsoil should be utilised to rehabilitate the bed and bank surface. The soil surface should also be re-instated to the virgin soil level and not depressed or elevated as this will promote erosion and cause flow barriers. After rehabilitation any excess soil or material should be removed and disposed of at a registered disposal facility. Installation of the pipeline through the watercourses should preferably be undertaken during the winter months (July to September) when baseflow will be at its lowest level.

A Risk Assessment for the proposed pipeline and crossing of watercourses has been undertaken according to the Department of Water & Sanitation's requirements for risk assessment and the provisional Risk Assessment Matrix for Section 21(c) & (i) water use (Appendix D). The excavation of trenches and removal of riparian vegetation is considered to have a moderate risk in terms of the watercourse crossings whilst the crossing of watercourses by means of pylon construction is considered to be of lower risk as the footprint and disturbance of watercourses will be lower.

8. Recommendations

- After construction of the pipeline the area must be rehabilitated. This includes removal of all construction material. Excavated rock may not be left in heaps and must be removed or distributed evenly over the terrain to represent a natural environment. Compacted areas must be ripped. Construction roads not being utilised afterwards must be rehabilitated.

- Problematic weeds must be eradicated where these establish on the constructed pipeline route (Appendix B). The watercourse crossings especially should be monitored for establishment of weeds.

- The route must be inspected for erosion due to construction. This is particularly relevant where watercourses or slopes are involved. Where erosion is evident this must be remedied.

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

- Due to a lower level of disturbance and the presence of large portions of intact and Threatened Blowmfontein Dry Grassland along the southern pipeline route (Route 1) the norther pipeline route is preferred (Map 1 & 2). Where this is not possible and the southern route is used, the following additional mitigation should be implemented:

    - The condition of the vegetation along the border fences is more degraded and the construction footprint should be minimised and retained within this area.
    - A walkthrough survey should be conducted by a qualified botanist/ecologist to identify and mark protected species along the pipeline route. It is recommended that any protected plant specimens which will be affected by the pipeline construction should be removed and transplanted adjacent to the pipeline in an area of suitable and similar habitat. Permits must be obtained for those specimens to be transplanted.

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

- Open trenches may act as pitfall traps to mammals, reptiles and amphibians and trenches should be daily monitored for trapped animals which should be removed promptly.

- In the event of poisonous snakes or other dangerous animals encountered on the site an experienced and certified snake handler or zoologist must remove these animals from the site and re-locate them to a suitable area.

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

- The necessary authorisations must be acquired from Department of Water Affairs (DWA) as well as the Department of Environmental Affairs (DEA) for the crossing of the watercourses along the pipeline route as listed in Table 9 (Map 1 & 2).

- Installation of the pipeline through the watercourses should preferably be undertaken during the winter months (July to September) when baseflow will be at its lowest level.

- When excavating in watercourses the upper 30 cm, or topsoil, should be removed together with the vegetation and stored as sods on the site. These should then be replaced on top of the installed pipeline. Subsoil should be used as backfilling and not as top dressing. Only removed sods and topsoil should be utilised to rehabilitate the bed and bank surface. The soil surface should also be re-instated to the virgin soil level and not depressed or elevated as this will promote erosion and cause flow barriers. After rehabilitation any excess soil or material should be removed and disposed of at a registered disposal facility.

- It is recommended that the aboveground installation of the pipeline on pylons at crossings be done as far as possible as this will lead to less disturbance.

- Where excavation takes place within watercourses, the excavated material should be stored outside the floodplain of the watercourse as soils will be washed into the main channel when placed within the stream.

- Where aboveground installation of the pipeline is done, the structure should be of sufficient design and strength to withstand flood damage.

- The construction period within and adjacent to watercourses must be kept to a minimum.

- The construction footprint along the watercourses should be kept to a minimum.

- Removal of vegetation along watercourses should also be kept to a minimum.

- The watercourse bed and bank morphology should also be re-instated as far as possible, which will also speed up the stabilisation of the bed and banks.

- Where steep banks occur and erosion is evidently problematic it is recommended that geotextiles be utilised to stabilise soils. Available options include contouring, berms, gabions and geotextile netting.

- Construction within the watercourses will require blocking of active flow. This should be done by blocking only half of the channel for construction whilst the remaining half is allowed to maintain flow. The timeframe for construction through watercourses should also be kept to a minimum.

- The construction footprint along the watercourses should be kept to a minimum.

- Removal of vegetation along watercourses should also be kept to a minimum.

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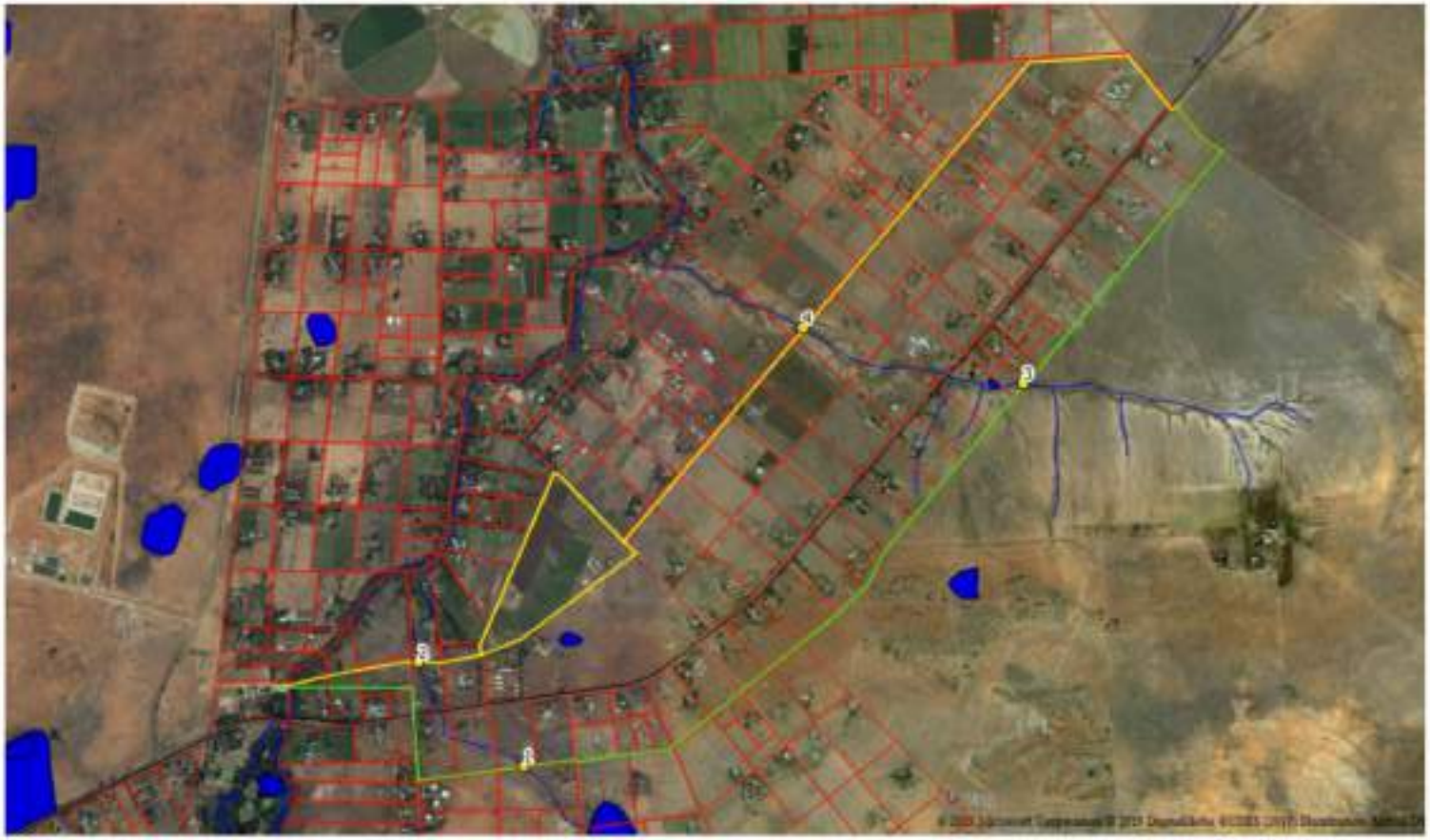
Annexure A: Maps and Site photos

Locality map for the proposed bulk water transfer pipeline in the Roodewal Small Holdings, Bloemfontein, Free State Province.



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Legend:
- Road network
- Watercourses
- Small Holdings
- Points of crossing
- Southern Pipeline (Route 1)
- Northern Pipeline (Route 2)
- Wetlands and impoundments

Map Information

Spheroid: WGS 84

Quantum GIS

Scale: 1:15 000

DPR Ecologists
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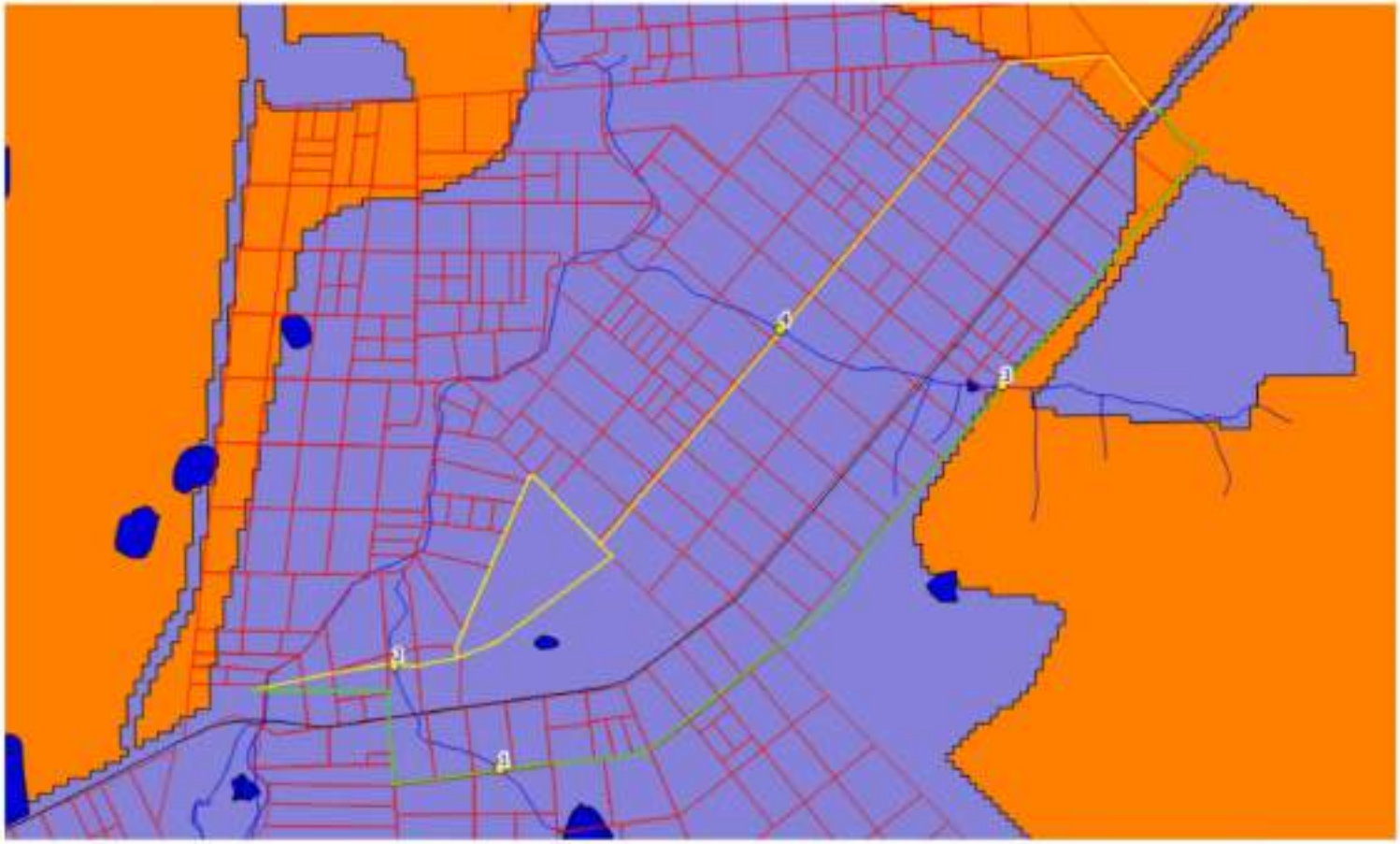
Map 1: Locality map of the proposed bulk water transfer pipeline in the Roodewal Small Holdings, Bloemfontein. The two affected small streams as well as the points of crossing by the two pipeline alternatives are indicated. It should also be clear that the northern alternative is situated in a much more transformed area as apposed to the southern route which contains extensive natural areas along the north east.

General ecology map for the proposed bulk water transfer pipeline in the Roodewal Small Holdings, Bloemfontein, Free State Province.



Preparred for:
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Legend:
- Road network
- Watercourses
- Small Holdings
- Points of crossing
- Southern Pipeline (Route 1)
- Northern Pipeline (Route 2)
- Threatened Ecosystems
- Wetlands and impoundments
- Bloemfontein Dry Grassland

Map Information

Spheroid: WGS 84

Quantum GIS

Scale: 1:15 000

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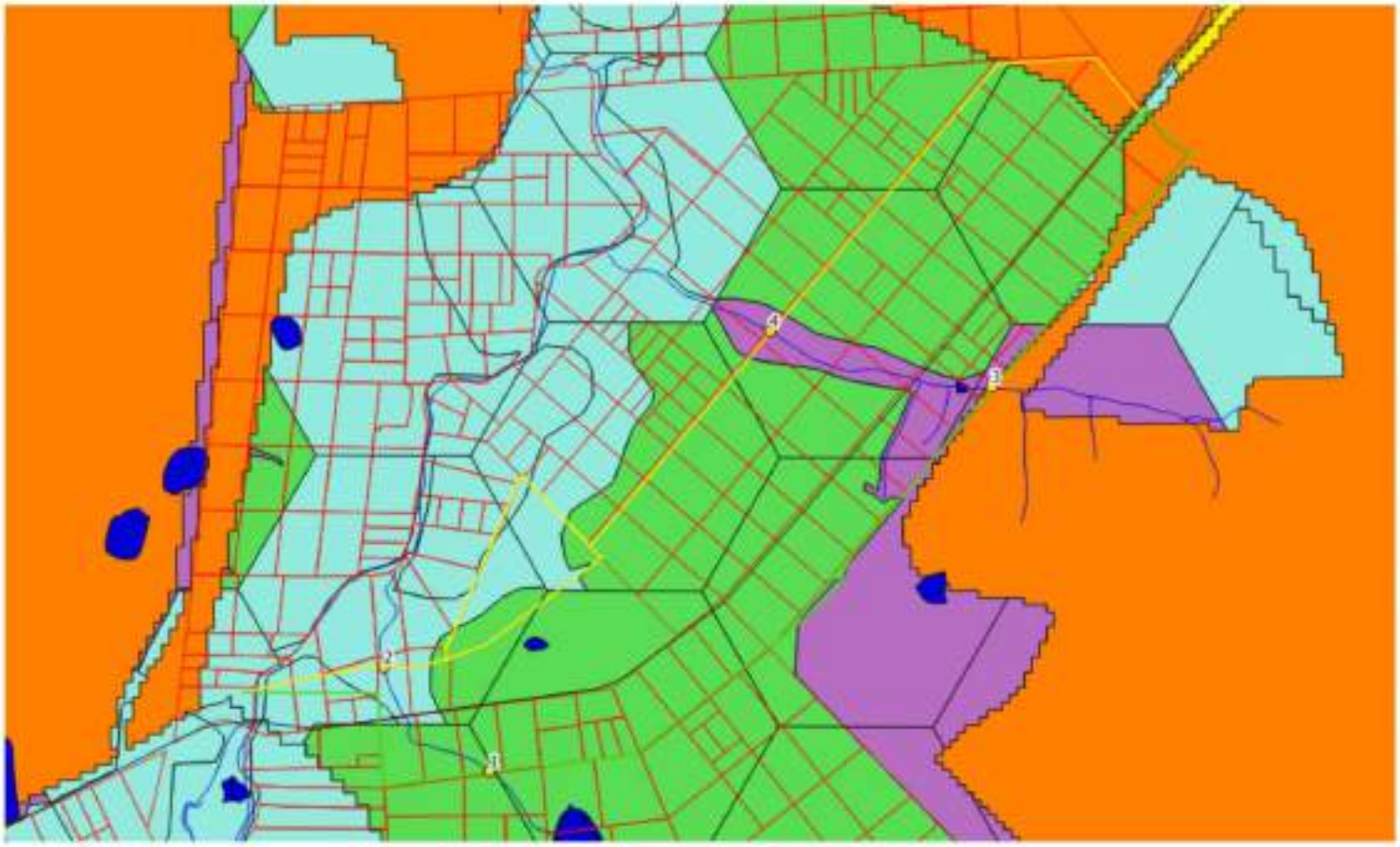
Map 2: General ecology map of the proposed bulk water transfer pipeline in the Roodewal Small Holdings, Bloemfontein. The respective pipeline alternatives and points of crossing of the two small stream systems are indicated. Portions of remaining natural vegetation, which are also regarded as being part of a Threatened Ecosystem, is also indicated. Note that these portions are mostly confined to the eastern portions of the Southern Pipeline alternative.

Free State Biodiversity Plan map for the proposed bulk water transfer pipeline in the Roodewal Small Holdings, Bloemfontein, Free State Province.



Preparred for:
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Legend:
- Road network
- Watercourses
- Small Holdings
- Points of crossing
- Southern Pipeline (Route 1)
- Northern Pipeline (Route 2)
- Threatened Ecosystems
- Wetlands and impoundments
- Critical Biodiversity Area 1
- Critical Biodiversity Area 2
- Ecological Support Area 1
- Ecological Support Area 2
- Degraded
- Other

Map Information

Spheroid: WGS 84

Quantum GIS

Scale: 1:15 000

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Map 3: Biodiversity Plan map of the proposed bulk water transfer pipeline in the Roodewal Small Holdings, Bloemfontein. Note that the Northern Pipeline alternative is mostly situated in a Degraded category whilst the Southern Pipeline alternative consists of Degraded, Other and Ecological Support Area 2 categories.

Figure 1: View of the environment along the Northern Pipeline alternative (Route 2). Note that the natural grassland is diminished and a vegetation structure dominated by dwarf karroid shrubs and trees have become established.

Figure 2: View of a portion of the Northern Pipeline alternative (Route 2). Large portions along this route consists of old agricultural fields dominated by weeds and pioneer herbs.

Figure 3: The vegetation along the Northern Pipeline alternative (Route 2) is evidently heavily degraded.

Figure 4: Remnant patches of the natural vegetation area however still present along the Northern Pipeline alternative (Route 2).

Figure 5: View of another remnant patch of natural vegetation along the Northern Pipeline alternative (Route 2) at the eastern border of the route.

Figure 6: View of the western portion along the Southern Pipeline alternative (Route 1). Patches of natural vegetation also remain here though the small holdings cause significant degradation of the vegetation.

Figure 7: As mentioned in Fig. 6 the natural vegetation along the western portion of the Southern Pipeline alternative (Route 1) has been significantly degraded as clearly indicated here.

Figure 7: The eastern portion along the Southern Pipeline alternative (Route 1) clearly still consists of natural grassland though its condition could not be accurately assessed due to lack of access.

Figure 8: The remaining natural vegetation along the Southern Pipeline alternative (Route 1) does however seem to more disturbed along the bordefences.

Figure 9: Tracks and signs of mammals along the pipeline routes include; on the left, numerous soil mounds of the Common Molerate (*Cryptomys hottentottus*) and on the right, scat of the Yellow Mongoose (*Cynictis penicillata*).

Appendix B: Likely invader weed species

Invader weed species along the pipeline routes may not be limited to these species but these are considered to be the most likely and significant invaders to occur. Additional sources should be consulted to confirm invader weed species as well as the best method to eradicate them.

According to the Conservation of Agricultural Resources Act, No. 43 of 1983 any Category 1 declared plants must be controlled by the land user on whose land such plants are growing.

Cirsium vulgare
Scotch Thistle/Skotse Dissel

Type: Weed
Category: 1

Mechanical removal is effective to control this weed. Cutting should be done below soil level and no leaves should remain.

Argemone ochroleuca
Mexican Poppy

Type: Weed
Category: 1

Mechanical removal by hand is effective against this weed.

Several chemicals have also been registered for control: 2, 4-D, 2, 4-DB, dicamba, diuron, fluroxypyr, hexazinone, isoproturon, karbutilate, MCPA, picloram and terbutryn.

Verbena bonariensis/Verbena officinalis
Purple Top/Vervain/Blouwaterbossie

Type: Weed
Category: Proposed 1b

When young, weed can easily be controlled by mechanical removal by hand or with broadleaf weed herbicides. When mature plants are tough and more tolerant to herbicides.

Xanthium strumarium
Large cocklebur/Kankerroos

Type: Weed
Category: 1

Mechanical removal by hand is effective to control this weed. Cutting is not recommended as this leads to re-sprouting.

Several chemicals have also been registered for control: bromoxynil, metribuzin, cyanazine/atrazine, bendioxide, MCPB, MCPA-K and 2,4-D(A), (T), (I).

Solanum eleagnifolium
Silver-leaf Bitter Apple/Satansbos

Type: Wees
Category: 1

Chemical control is most effective for control of this weed. Garlon 4 (triclopyr) is the only registered herbicide for control.

Datura ferox
Large thorn-apple/Grootstinkblaar

Type: weed
Category: 1

Mechanical removal by hand is effective for this weed.

Gleditsia triacanthos
Honeylocust/Soetpeulboom

Type: Invader
Category: 1

The species is not easily controlled by mechanical removal but is susceptible to herbicides used as cut-stump or basal bark treatments.

Opuntia humifusa
Creeping Prickly Pear

Type: Weed
Category: 1

Mechanical control is effective for single specimens. All parts of the plant must be removed and burned.

Chemical is most effective control method. Monosodium methanearsonate (MSMA) and glyphostae must be injected into the stem as concentrated solutions.

Nicotiana glauca
Wild Tobacco/Tabakboom

Type: Weed
Category: 1

Mechanical control is effective when specimens are still small.

There are no specific herbicides registered for it, but it should be susceptible to the usual herbicides

Pyracantha angustifolia
Firethorn/Branddoring

Type: Invader
Category: 1

Several herbicides are known to be effective. These include Round-up, Starane, Access, Grazon, Garlon and Brush Off.

The method of application depends on the herbicide used.

Appendix C: Index of Habitat Integrity (IHI) Summary

ASSESSMENT UNIT INFORMATION	
ASSESSMENT UNIT INFORMATION	Roodewal Pipeline
UPPER LATITUDE	S 29.098807
UPPER LONGITUDE	E 26.341049
UPPER ALTITUDE	1337 m
LOWER LATITUDE	S 29.082870
LOWER LONGITUDE	E 26.352897
LOWER ALTITUDE	1334 m
SURVEY SITE (if applicable)	
SITE LATITUDE (if applicable)	
SITE LONGITUDE (if applicable)	
SITE ALTITUDE (if applicable)	
WMA	Upper Orange
QUATERNARY	C52F
ECOREGION 2	11_10
DATE	27/06/2019
RIVER	Seasonal streams
TRIBUTARY	Renostersprui t
PERENNIAL (Y/N)	**N**
GEOMORPH ZONE	**FOOTHILL**
WIDTH (m)	**2-15**

METRIC GROUP	RATING	CONFIDENCE
HYDROLOGY MODIFICATION	1.7	2.0
PHYSICO-CHEMICAL MODIFICATION	1.3	3.0
BED MODIFICATION	2.0	4.0
BANK MODIFICATION	2.0	3.0
CONNECTIVITTY MODIFICATION	2.0	4.0
INSTREAM IHI%	64.6	
CATEGORY	C	
CONFIDENCE	3.2	

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

METRIC GROUP	RATING	CONFIDENCE
HYDROLOGY	1.42	3.00
BANK STRUCTURE MODIFICATION	2.61	4.00
CONNECTIVITY MODIFICATION	1.84	4.00
RIPARIAN HABITAT INTEGRITY (%)	59.15	
CATEGORY	C/D	
CONFIDENCE	3.67	

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

	MRU
INSTREAM IHI	
Base Flows	-2.0
Zero Flows	1.0
Floods	-2.0
HYDROLOGY RATING	**1.7**
pH	1.0
Salts	1.5
Nutrients	1.5
Water Temperature	1.0
Water clarity	2.0
Oxygen	1.0
Toxics	1.0
PC RATING	**1.3**
Sediment	2.0
Benthic Growth	2.0
BED RATING	**2.0**
Marginal	2.0
Non-marginal	2.0
BANK RATING	**2.0**
Longitudinal Connectivity	2.0
Lateral Connectivity	2.0
CONNECTIVITY RATING	**2.0**
INSTREAM IHI %	**64.6**
INSTREAM IHI EC	**C**
INSTREAM CONFIDENCE	**3.2**

	MRU
RIPARIAN IHI	
Base Flows	-1.5
Zero Flows	1.0
Moderate Floods	-1.5
Large Floods	-1.5
HYDROLOGY RATING	**1.4**
Substrate Exposure (marginal)	2.0
Substrate Exposure (non-marginal)	3.0
Invasive Alien Vegetation (marginal)	2.0
Invasive Alien Vegetation (non-marginal)	2.0
Erosion (marginal)	2.0
Erosion (non-marginal)	2.0
Physico-Chemical (marginal)	1.5
Physico-Chemical (non-marginal)	3.0
Marginal	2.0
Non-marginal	3.0
BANK STRUCTURE RATING	**2.6**
Longitudinal Connectivity	2.0
Lateral Connectivity	1.5
CONNECTIVITY RATING	**1.8**
RIPARIAN IHI %	**59.1**
RIPARIAN IHI EC	**C/D**
RIPARIAN CONFIDENCE	**3.7**

Appendix E: Risk Assessment Matrix

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

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

					Severity																
No.	**Phases**	**Activity**	**Aspect**	**Impact**	**Flow Regime**	**Physico & Chemical (Water Quality)**	**Habitat (Geomorph+Vegetation)**	**Biota**	**Severity**	**Spatial scale**	**Duration**	**Consequence**	**Frequency of activity**	**Frequency of impact**	**Legal Issues**	**Detection**	**Likelihood**	**Significance**	**Risk Rating**	**Confidence level**	**Control Measures**
1	All Phases	Installation of bulk water transport pipeline through watercourses.	Excavation and backfilling of trenches	Excavation of trenches will impeded flow while trenches are open. Disturbance of the bed and banks will promote sedimentation.	**3**	**2**	**2**	**1**	**2**	**1**	**3**	**6**	**2**	**2**	**5**	**2**	**11**	**66**	**M**	**4**	Control measures which can be utilised to decrease the risk include the following. Installation of pipelines during winter months when seasonal systems will not contain a baseflow and flow regime alteration will be minimal. Correct backfilling and using the removal of sods as rehabilitation.
			Removal of riparian vegetation	Removal of riparian vegetation will promote erosion and sedimentation of watercourses. Disturbance and removal of vegetation will create conditions susceptible to the establishment of exotic weeds.	1	2	3	3	2.25	1	3	6.25	2	2	5	2	**11**	**68.75**	**M**	4	Adequate rehabilitation and replacement of sods to decrease rehabilitation period. Adequate weed control to prevent establishment of weeds and promote establishment of indigenous riparian vegetation.
			Construction of pipeline pylons	Construction of pylons will cause limited disturbance of the bed and banks which will also promote erosion and sedientation but will be less than the excvataion of trenches. Removal of vegetation will be more limited than trench excavation. Pylons will form a obstruction to flow which will be low as long as pylon footprints are small.	1	1	1	1	1	1	3	5	2	2	5	2	**11**	**55**	**L**	4	Pylons will have a smaller footprint and require less disturbance of vegetation and the soil profile and will therefore entail a lower risk.

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EKO•ENVIRONMENTAL

Report on the floristic and ecological assessment of the proposed construction of a bulk water transfer pipeline from the Maselspoort Dam and purification plant to the New Northern Waste Water Treatment Works (WWTW) and Bloemfontein WWTW, Bloemfontein, Free State Province.

January 2015

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Table of contents

Vegetation and ecological assessment.

Vegetation and ecological assessment.

1. Introduction

1.1 Background

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

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

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

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

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

The proposed pipeline will be constructed from the Maselspoort Dam and the associated purification plant to the New Northern Waste Water Treatment Works (WWTW) and Bloemfontein WWTW (Map 1). The function of the pipeline will be to transport treated waste water to the purification plant at the Maselspoort Dam and from there back to Bloemfontein for re-use. Several streams and rivers will be crossed by the pipeline.

A site visit was conducted on 13 January 2015. The route of the pipeline was surveyed by means of sample transects.

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

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

1.2 The value of biodiversity

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

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

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

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

2. Scope and limitations

- To evaluate the present state of the vegetation and ecological functioning of the area proposed for the pipeline development.
- To identify possible negative impacts that could be caused by the proposed construction of a pipeline.

2.1 Vegetation

Aspects of the vegetation that will be assessed include:

- The vegetation types of the region with their relevance to the proposed site.
- The overall status of the vegetation on site.
- Species composition with the emphasis on dominant-, rare- and endangered species.

The amount of disturbance present on the site assessed according to:

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

2.2 Fauna

Aspects of the fauna that will be assessed include:

- A basic survey of the fauna occurring in the region using visual observations of species as well as evidence of their occurrence in the region (burrows, excavations, animal tracks, etc.).
- The overall condition of the habitat.
- A list of species that may occur in the region (desktop study).

2.3 Limitations

Several bulbous and herbaceous species may have finished flowering and may have been overlooked or not identifiable.
Due to time constraints the entire pipeline route could not be surveyed and only likely sensitive areas were surveyed. It is therefore possible that sensitive species may have been overlooked.
Some animal species may not have been observed as a result of their nocturnal and/or shy habits.

3. Methodology

3.1 Several literature works were used for additional information.

Vegetation:
Red Data List (Raymondo *et al.* 2009)
Vegetation types (Mucina & Rutherford 2006)
Field guides used for species identification (Bromilow 1995, 2010, Coates-Palgrave 2002, Manning 2009, Moffett 1997, Van Oudtshoorn 2004, Van Wyk & Malan 1998, Van Wyk & Van Wyk 1997, Venter & Joubert 1985).

Terrestrial fauna:
Field guides for species identification (Smithers 1986a).

3.2 Survey

The site was assessed by means of transects and sample plots.

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

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

3.3 Criteria used to assess sites

Several criteria were used to assess the site and determine the overall status of the environment.

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

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

Presence of rare and endangered species: The actual occurrence or potential occurrence of rare or endangered species on a proposed site plays a large role on the feasibility of a development. Depending on the status and provincial conservation policy, presence of a Red Data species can potentially be a fatal flaw.
Scoring: Occurrence actual or highly likely – 1, Occurrence possible – 2, Occurrence highly unlikely – 3.

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

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

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

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

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

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

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

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

Faunal characteristics
Presence of rare and endangered species: The actual occurrence or potential occurrence of rare or endangered species on a proposed site plays a large role on the feasibility of a development. Depending on the status and provincial conservation policy, presence of a Red Data species or very unique and sensitive habitats can potentially be a fatal flaw.
Scoring: Occurrence actual or highly likely – 1, Occurrence possible – 2, Occurrence highly unlikely.

3.4 Biodiversity sensitivity rating (BSR)

The total scores for the criteria above were used to determine the biodiversity sensitivity ranking for the sites. On a scale of 0 – 30, six different classes are described to assess the suitability of the sites to be developed. The different classes are described in the table below:

Table 1: Biodiversity sensitivity ranking

BSR	BSR general floral description	Floral score equating to BSR class
Ideal (5)	Vegetation is totally transformed or in a highly degraded state, generally has a low level of species diversity, no species of concern and/or has a high level of invasive plants. The area has lost its inherent ecological function. The area has no conservation value and potential for successful rehabilitation is very low. The site is ideal for the proposed development.	29 – 30
Preferred (4)	Vegetation is in an advanced state of degradation, has a low level of species diversity, no species of concern and/or has a high level of invasive plants. The area's ecological function is seriously hampered, has a very low conservation value and the potential for successful rehabilitation is low. The area is preferred for the proposed development.	26 – 28
Acceptable (3)	Vegetation is notably degraded, has a medium level of species diversity although no species of concern are present. Invasive plants are present but are still controllable. The area's ecological function is still intact but may be hampered by the current levels of degradation. Successful rehabilitation of the area is possible. The conservation value is regarded as low. The area is acceptable for the proposed development.	21 – 25
Not preferred (2)	The area is in a good condition although signs of disturbance are present. Species diversity is high and species of concern may be present. The ecological function is intact and very little rehabilitation is needed. The area is of medium conservation importance. The area is not preferred for the proposed development.	11 – 20
Sensitive (1)	The vegetation is in a pristine or near pristine condition. Very little signs of disturbance other than those needed for successful management are present. The species diversity is very high with several species of concern known to be present. Ecological functioning is intact and the conservation importance is high. The area is regarded as sensitive and not suitable for the proposed development.	0 - 10

4. Ecological overview of the site

4.1 Overview of ecology and vegetation types (Mucina & Ruterford 2006)

According to Mucina & Rutherford (2006) the area consists of Highveld Alluvial Vegetation (AZa 5) and Bloemfontein Dry Grassland (Gh 5). Of these vegetation types the Highveld Alluvial Vegetation is considered to be of Least Concern but the Bloemfontein Dry Grassland is listed as a Threatened Ecosystem with a status of Vulnerable (VU) (National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004)) (Map 2). Large portions of this grassland has been transformed by dryland crop cultivation and urbanisation.

The topography of the pipeline route consists of undulating plains with isolated hills in the north of the route. These hills consist of dolerite capped mesas but will not be affected by the pipeline as it will remain in the bottomlands away from these hills. Treated waste water will be transported via the pipeline from the New Northern WWTW and Bloemfontein WWTW to the Maselspoort Dam and treatment works where the water will be purified and then transported via the pipeline back to Bloemfontein for human consumption. The pipeline route will be from the oxidation ponds of the Bloemfontein WWTW from where it will cross the Bloemspruit and will be located south of the new racecourse development. The pipeline will cross the N8 National Road and will be installed alongside the Maselspoort Road. A short stretch of pipeline will connect to the main pipeline from the New Northern WWTW. From here the pipeline will cross the Renosterspruit and continue along the Maselspoort Road through the Roodewal Small Holdings up to the Phillip Saunders turnoff and from this turnoff the pipeline will follow the road to the Maselspoort Dam. From the Renosterspruit crossing up to the Maselspoort Dam the pipeline will cross four other small streams. The landscape from the Maselspoort Dam to the beginning of the small holdings are largely natural and is utilised as natural grazing. From the small holdings to the WWTW the natural landscape has been transformed to varying degrees.

The majority of the pipeline route will follow the tarred road (Map 1). The areas adjacent to this road has also been degraded by the impact of the road, firebreaks along the fence and dirt tracks. However, the pipeline still crosses several sensitive areas consisting of natural streams (Map 1 & 2).

The vegetation structure along the pipeline route is dominated by a uniform grass layer. However, near the Maselspoort Dam and consisting of a large area consists of thicket associated with the Modder River. The Modder River near the Maselspoort Dam also contains a dense riparian thicket with sedge and reed beds. The seasonal streams along the route consist of sedge and reed layers. The Bloemspruit and Renosterspruit also contain dense thicket and reed beds.

No rare or endangered species could be identified along the pipeline route except for one species (Appendix B). This species, *Crinum bulbispermum* (Orange River Lily) occurs along the Modder River and the two seasonal streams being crossed by the pipeline near Maselspoort. This species is currently listed in the National Red List as being a Declining species. The species is widespread but can be considered as somewhat rare and rapidly declining. It must be regarded as having a significant conservation value. Due to the small footprint of the pipeline only a small portion of the population will be affected. It is recommended that all specimens which will be affected by the pipeline construction should be removed and transplanting adjacent to the pipeline in an area of suitable and similar habitat. Permits must be obtained for those specimens to be transplanted.

The vegetation along the majority of the pipeline route consists of Bloemfontein Dry Grassland which is considered a Threatened Ecosystem and listed as being Vulnerable (VU) (Map 2). A large portion of the pipeline route from the Roodewal Small Holdings to the crossing of the N8 National Road is in varying degrees of degradation and transformation and is consequently no longer considered to be representative of this vegetation type. The footprint of the pipeline will be small and not a large portion of the vegetation will be transformed. The pipeline will follow the Maselspoort road and will be installed adjacent to the road just outside of the road reserve inside the farm fence. The survey has indicated that this area has been degraded to varying degrees. The area has been utilised as a firebreak and dirt tracks and the vegetation has therefore been degraded to varying degrees. The installation of the pipeline should be confined to this disturbed portion outside the road reserve. The footprint of the construction and installation of the pipeline should be kept to a minimum. Strict mitigation should be implemented especially regarding the handling of topsoil including removal and replacement thereof to ensure that as natural as possible vegetation re-establishes on the site.

The pipeline will cross two perennial rivers and four smaller seasonal streams (Map 1 & 2).

The perennial rivers consist of the Bloemspruit and Renosterspruit. They are considered to have a PES of Category F: Critically/Extremely modified. Modifications have reached a critical level and the system has been modified completely with an almost complete loss of natural habitat and biota. In the worst instances the basic ecosystem functions have been destroyed and the changes are irreversible. In spite of this seriously modified nature these streams still provide a vital ecosystem service as water conduits and must therefore still be considered sensitive. Several impacts on the streams have caused this modified condition. The streams are naturally only seasonal. However, due to canalisation and runoff from urban areas and industry they are now perennial systems. This has had a profound impact on riparian vegetation and the flood dynamics of these rivers. The streams flow through urban and industrial areas which contribute highly polluted runoff. This leads to high levels of pollution within the streams. A large portion of the Bloemspruit has been canalised. This has a large impact on the functioning of the stream in terms of flood dynamics and the ecosystem services rendered by an intact riparian community. The Bloemspruit flows past the Bloemfontein WWTW which does not have sufficient capacity and consequently untreated sewage overflows into the stream further leading to high levels of pollution and degradation of the stream. High levels of rubbish dumping takes place within the catchment and in stream and this further degrades these streams. The Bloemspruit feeds into the Renosterspruit and consequently the degraded condition both impact on each other.

North of the Renosterspruit crossing and within the Roodewal Small Holdings a small seasonal stream is crossed. This stream flows through the small holdings which are disturbed and transformed. As a consequence the stream is also degraded and disturbed. Despite this it must be regarded as sensitive and care must be taken when crossing this stream.

Approximately 2.3 km before the Maselspoort Dam turnoff the pipeline will cross a small seasonal stream. The stream has its origins within the surrounding natural grassland. A small weir has been constructed in the stream damming runoff and the stream is also crossed by the tarred road. These impacts have an influence on the stream but it is considered largely natural and in a good condition. The main channel of the stream is not well defined and it may be difficult to discern this stream. This stream must be regarded as being sensitive and utmost care must be taken when crossing this stream. Mitigation measures should include keeping the

footprint to a minimum, taking utmost care with topsoil, monitoring of weed establishment and no manholes within 32 meters of the stream.

From the Maselspoort Dam turnoff to the dam itself the pipeline crosses two seasonal streams which are 300 meters from each other. Both of these have their origins to the south of the road and within the natural surrounding grassland. Small weirs have been constructed in their flow channels but few other impacts are evident on these streams. As a result they are relatively unchanged, natural and in a good condition. Numerous specimens of the Red Listed and Declining *Crinum bulbispermum* (Orange River Lily) occur along the banks of these streams. This also increases the sensitivity of these streams. They must be considered as sensitive and utmost care must be taken when construction occurs near these streams. Mitigation measures should include keeping the footprint to a minimum, taking utmost care with topsoil, monitoring of weed establishment, transplanting of affected Red Listed species and no manholes within 32 meters of the stream.

The pipeline will turn south at the Modder River to the Maselspoort Dam. Though the pipeline will not cross the river it will be located in close proximity to it. The pipeline must preferably be kept more than 32 meters away from the river and care must be taken to keep impacts to a minimum.

Table 2: Summary of streams and position of pipeline crossing.

Stream	Position of crossing
Perennial river (Bloemspruit) - feeds into the Renosterspruit	S 29.121476˚ E 26.281671˚
Perennial river (Renosterspruit) - feeds into Modder River	S 29.097219˚ E 26.331583˚
Seasonal Stream 1 (unnamed) - flowing through small holdings, feeds into Renosterspruit	S 29.084682˚ E 26.358735˚
Seasonal Stream 2 (unnamed) - flowing through natural area feeds into Modder River	S 29.059779˚ E 26.382869˚
Seasonal Stream 3 (unnamed) - flowing through natural area feeds into Modder River	S 29.046532˚ E 26.410740˚
Seasonal Stream 4 (unnamed) - flowing through natural area feeds into Modder River	S 29.047762˚ E 26.414023˚

4.2 Overview of terrestrial mammals (actual & possible)

No mammal species could be identified on the pipeline route although it is clear by the amount of burrows and signs of animal life that the area contains a substantive and healthy mammal population. However, the proximity of the pipeline route to the tarred road will cause a decrease in the mammal population. The impact on mammal species is anticipated to be low as the pipeline will have a small footprint size and after construction the area will return to a natural condition.

The only factor that would have a high impact on the mammal population would be the hunting, capturing and trapping of mammal. This must be strictly prohibited.

List of some Red Data terrestrial mammals that could occur in the region:

South African Hedgehog	*Atelerix frontalis*
Aardwolf	*Proteles cristatus*
African Wild Cat	*Felis lybica*
Small-Spotted Cat	*Felis nigripes*
Bat-Eared Fox	*Otocyon megalotis*
Striped Weasel	*Poecilogale albinucha*

It is considered likely that some of these species may occur within the area but is unlikely that they would be directly affected by installation of the pipeline due to the small footprint as long as hunting, capturing and trapping of animals is prohibited.

5. Site specific results

Habitat diversity and species richness:
Habitat diversity along the pipeline route is moderate. The site consists predominately of grassland with thicket along the northern portion of the route. The perennial- and seasonal streams along the route also contribute to habitat diversity (Map 1). Despite the variety of habitats the species diversity is uniform and relatively low.

Presence of rare and endangered species:
No rare or endangered species could be identified along the pipeline route except for one species (Appendix B). This species, *Crinum bulbispermum* (Orange River Lily) occurs along the Modder River and the two seasonal streams being crossed by the pipeline near Maselspoort. This species is currently listed in the National Red List as being a Declining species. The species is widespread but can be considered as somewhat rare and rapidly declining. It must be regarded as having a significant conservation value. Due to the small footprint of the pipeline only a small portion of the population will be affected. It is recommended that all specimens which will be affected by the pipeline construction should be removed and transplanting adjacent to the pipeline in an area of suitable and similar habitat. Permits must be obtained for those specimens to be transplanted.

Ecological function:
The ecological function along the pipeline is intact where it occurs in natural grassland. Where the pipeline route occurs along the small holdings to the south of the route the ecological has been transformed and degraded. The ecological function of the seasonal streams along the route is relatively intact except for the seasonal stream 1 which flows through the Roodewal Small Holdings. The ecological function of the Bloemspruit and Renosterspruit has been altered to a large degree. In spite of this all the watercourses remain sensitive and provide vital ecological functions. In these areas the impact of construction must be kept to a minimum.

Degree of rarity/conservation value:
The vegetation along the majority of the pipeline route consists of Bloemfontein Dry Grassland which is considered a Threatened Ecosystem and listed as being Vulnerable (VU) (Map 2). The footprint of the pipeline will be small and not a large portion of the vegetation will be transformed. The survey has indicated that the area adjacent the road reserve where the pipeline will be installed has been degraded to varying degrees. The conservation value is therefore only considered to be moderate.

The condition of the seasonal streams along the route is relatively natural and good except for the seasonal stream 1 which flows through the Roodewal Small Holdings. The condition of the Bloemspruit and Renosterspruit is poor, degraded and transformed to a large degree. In spite of this all the watercourses remain sensitive and have a significant conservation value.

Percentage ground cover:
The percentage ground cover is relatively high except in the south where the route occurs in the Roodewal Small Holdings.

Vegetation structure:
The vegetation structure consists predominately of grassland except in the north where it is dominated by thicket along the Modder River. This is considered natural except where the route occurs in the Roodewal Small Holdings and here it has been altered.

Infestation with exotic weeds and invader plants:
Infestation by exotic weeds are relatively low except along the Modder River itself, along the seasonal streams as well as along the portion within the Roodewal Small Holdings where exotics dominate in some areas (Appendix C).

Degree of grazing/browsing impact:
The majority of the area is being utilised as grazing for domestic stock. As a result the amount of overgrazing is moderate.

Signs of erosion:
Erosion along the pipeline route is relatively low but along the seasonal streams a limited amount of erosion is present.

Terrestrial animals:
It is considered likely that some species of conservational importance may occur within the area but is unlikely that they would be directly affected by installation of the pipeline due to the small footprint as long as hunting, capturing and trapping of animals is prohibited.

Table 3: Biodiversity Sensitivity Rating for the proposed pipeline.

	Low (3)	Medium (2)	High (1)
Vegetation characteristics			
Habitat diversity & Species richness		2	
Presence of rare and endangered species		2	
Ecological function		2	
Uniqueness/conservation value		2	
Vegetation condition			
Percentage ground cover		2	
Vegetation structure		2	
Infestation with exotic weeds and invader plants or encroachers	3		
Degree of grazing/browsing impact		2	
Signs of erosion		2	
Terrestrial animal characteristics			
Presence of rare and endangered species	3		
Sub total	6	16	
Total		22	

6. Biodiversity sensitivity rating (BSR) interpretation

Table 4: Interpretation of Biodiversity Sensitivity Rating.

Site	Score	Site Preference Rating	Value
Maselspoort pipeline	22	Acceptable	3

7. Discussion and conclusions

The pipeline route proposed for the construction of the Maselspoort pipeline from the Maselspoort Dam and purification plant to the New Northern Waste Water Treatment Works (WWTW) and Bloemfontein WWTW has been rated as being acceptable.

According to Mucina & Rutherford (2006) the area consists of Highveld Alluvial Vegetation (AZa 5) and Bloemfontein Dry Grassland (Gh 5). Of these vegetation types the Highveld Alluvial Vegetation is considered to be of Least Concern but the Bloemfontein Dry Grassland is listed as a Threatened Ecosystem with a status of Vulnerable (VU) (National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004)) (Map 2). Large portions of this grassland has been transformed by dryland crop cultivation and urbanisation.

No rare or endangered species could be identified along the pipeline route except for one species (Appendix B). This species, *Crinum bulbispermum* (Orange River Lily) occurs along the Modder River and the two seasonal streams being crossed by the pipeline near Maselspoort. This species is currently listed in the National Red List as being a Declining species. The species is widespread but can be considered as somewhat rare and rapidly declining. It must be regarded as having a significant conservation value. Due to the small footprint of the pipeline only a small portion of the population will be affected. It is recommended that all specimens which will be affected by the pipeline construction should be removed and transplanting adjacent to the pipeline in an area of suitable and similar habitat. Permits must be obtained for those specimens to be transplanted.

The vegetation along the majority of the pipeline route consists of Bloemfontein Dry Grassland which is considered a Threatened Ecosystem and listed as being Vulnerable (VU) (Map 2). A large portion of the pipeline route from the Roodewal Small Holdings to the crossing of the N8 National Road is in varying degrees of degradation and transformation and is consequently no longer considered to be representative of this vegetation type. The footprint of the pipeline will be small and not a large portion of the vegetation will be transformed. The pipeline will follow the Maselspoort road and will be installed adjacent to the road just outside of the road reserve inside the farm fence. The survey has indicated that this area has been degraded to varying degrees. The area has been utilised as a firebreak and dirt tracks and the vegetation has therefore been degraded to varying degrees. The installation of the pipeline should be confined to this disturbed portion outside the road reserve. The footprint of the construction and installation of the pipeline should be kept to a minimum. Strict mitigation should be implemented especially regarding the handling of topsoil including removal and replacement thereof to ensure that as natural as possible vegetation re-establishes on the site.

It is considered likely that some mammal species of conservational importance may occur within the area but is unlikely that they would be directly affected by installation of the pipeline due to the small footprint as long as hunting, capturing and trapping of animals is prohibited.

The pipeline will cross two perennial rivers and four smaller seasonal streams as listed in Table 5 (Map 1). The condition of the seasonal streams along the route is relatively natural and good except for the seasonal stream 1 which flows through the Roodewal Small Holdings. The condition of the Bloemspruit and Renosterspruit is poor, degraded and transformed to a large degree. In spite of this all the watercourses remain sensitive and have a significant conservation value. Installation of the pipeline through these streams will lead to disturbance. To keep disturbance to a minimum several mitigation measures must be implemented. The

installation of the pipeline should preferably occur during periods of low or no flow. If there is still visible surface water in the stream during construction only half of the stream may be blocked off. Free flow of the stream should be able to take place at any time during construction. The construction footprint along the streams should be kept to a minimum. Topsoil should be carefully removed to a depth of 30 cm and stored. Once the pipeline is installed the topsoil should be replaced to virgin soil level and not elevated as this will act as a water barrier. Excess soil should be removed from the site. The construction area should be monitored for the establishment of weeds following construction. The two northern seasonal stream contain specimens of the Red Listed and Declining *Crinum bulbispermum* which must be transplanted to an adjacent area where they will not be affected by construction. No manholes should be constructed within 32 meters of these streams. The necessary authorisations must be acquired from Department of Water Affairs (DWA) as well as the Department of Environmental Affairs (DEA) for the crossing of these streams.

Table 5: Summary of streams and position of pipeline crossing.

Stream	**Position of crossing**
Perennial river (Bloemspruit) - feeds into the Renosterspruit	S 29.121476˚ E 26.281671˚
Perennial river (Renosterspruit) - feeds into Modder River	S 29.097219˚ E 26.331583˚
Seasonal Stream 1 (unnamed) - flowing through small holdings, feeds into Renosterspruit	S 29.084682˚ E 26.358735˚
Seasonal Stream 2 (unnamed) - flowing through natural area feeds into Modder River	S 29.059779˚ E 26.382869˚
Seasonal Stream 3 (unnamed) - flowing through natural area feeds into Modder River	S 29.046532˚ E 26.410740˚
Seasonal Stream 4 (unnamed) - flowing through natural area feeds into Modder River	S 29.047762˚ E 26.414023˚

8. Recommendations

- After construction of the pipeline the area must be rehabilitated. This includes removal of all construction material. Excavated rock may not be left in heaps and must be removed or distributed evenly over the terrain to represent a natural environment. Compacted areas must be ripped. Roads not being utilised afterwards must be rehabilitated.

- Problematic weeds must be eradicated where these establish on the constructed pipeline route (Appendix C). The stream crossings especially should be monitored for establishment of weeds.

- The route must be inspected for erosion due to construction. This is particularly relevant where streams or slopes are involved. Where erosion is evident this must be remedied.

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

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

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

- Where construction takes place within natural grassland the footprint should be kept to a minimum.

- The Red Listed and Declining bulb, *Crinum bulbispermum (Orange River Lily)*, which occurs along the northern seasonal streams must be transplanted where it will not be affected by construction (Appendix B). The necessary permits must be obtained for transplanting the species.

- The necessary authorisations must be acquired from Department of Water Affairs (DWA) as well as the Department of Environmental Affairs (DEA) for the crossing of the streams along the route as listed in Table 5 (Map 1).

- The installation of the pipeline should preferably occur during periods of low or no flow. If there is still visible surface water in the stream during construction only half of the stream may be blocked off. Free flow of the stream should be able to take place at any time during construction.

- The construction footprint along the streams should be kept to a minimum.

- Topsoil should be carefully removed to a depth of 30 cm and stored. Once the pipeline is installed the topsoil should be replaced to virgin soil level and not elevated as this will act as a water barrier. Excess soil should be removed from the site.

- No manholes should be constructed within 32 meters of these streams.

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Annexure A: Maps and Site photos

Locality map for the proposed construction of a bulk water transfer pipeline from the Maselspoort Dam and purification plant to the New Northern Waste Water Treament Works (WWTW) and the Bloemfontein WWTW, Bloemfontein, Free State Province.

Preparred for:
MDA Consultants
9 Barnes Street
Westdene
9301

Legend:

- Maselspoort Road
- N8 National Road
- Watercourses
- Pipeline Route
- Watercourse Crossings

Map Information

Spheroid: WGS 84

Scale:

0 1.4 2.8 4.2
Scale (km)

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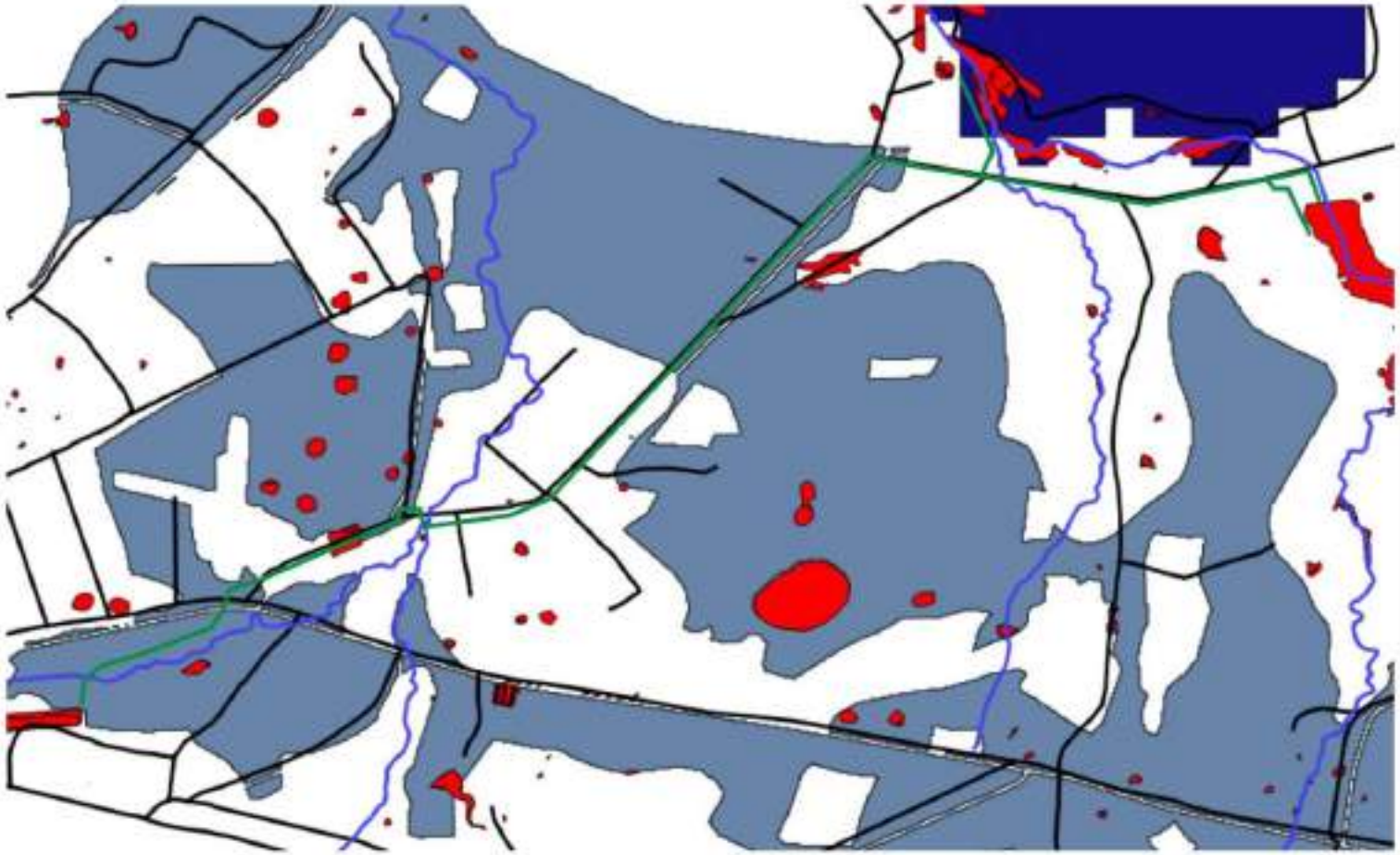
Fax: 086 6976 132

Map 1: Location of the proposed construction of a bulk water transfer pipeline from the Maselspoort dam and purification plant to the New Northern WWTW and Bloemfontein WWTW, Bloemfontein, Free State Province.

Sensitivity map for the proposed construction of a bulk water transfer pipeline from the Maselspoort Dam and purification plant to the New Northern Waste Water Treament Works (WWTW) and the Bloemfontein WWTW, Bloemfontein, Free State Province.



Preparred for:
MDA Consultants
9 Barnes Street
Westdene
9301

Legend:

- Road Network
- NFEPA Watercourses
- Pipeline Route
- Wetlands
- Threatened Ecosystems
- NPAES Focus Areas

Map Information

Spheroid: WGS 84

Scale: 1:60 000

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Map 2: Sensitivity of the proposed construction of a bulk water transfer pipeline from the Maselspoort dam and purification plant to the New Northern WWTW and Bloemfontein WWTW, Bloemfontein, Free State Province. The extent of remaining Threatened Ecosystems is indicated as well as wetlands and National Freshwater Ecosystems Priority Areas (NFEPA) watercourses. Note that the pipeline will not form part of a National Protected Areas Expansion Strategy (NPAES) Focus Area.

Figure 1: View of the Modder River the pipeline will be installed to the west of the river and will not cross it.

Figure 2: View west of the Modder River indicating the approximate location of the proposed pipeline (red line).

Figure 3: Position of the pipeline along the northern portion leading to the Maselspoort Dam (red line). Note the dense thicket occurring in this area.

Figure 4: View of the northern portion of the proposed pipeline (red line). Note grassland in relatively good condition but uniform species composition.

Figure 5: View of the seasonal stream 4 in the northern portion of the pipeline route. The stream will be crossed by the pipeline and is in a good condition, utmost care must be taken to keep the impact on the stream to a minimum.

Figure 6: View of the seasonal stream 3 in the northern portion of the pipeline route. The stream will be crossed by the pipeline and is in a good condition, utmost care must be taken to keep the impact on the stream to a minimum.

Figure 7: View of seasonal stream 3. Note also the Red Listed and Declining *Crinum bulbispermum* which will be affected by the pipeline construction (red circles). These are only a few of the specimens which are present at this stream.

Figure 8: A portion of the pipeline route within the northern natural area. Note that the area outside the road reserve is degraded due to being cleared as a firebreak.

Figure 9: A portion of the pipeline route within the northern natural area. Note that the area outside the road reserve is degraded due to being cleared as a firebreak.

Figure 10: View of the seasonal stream 2 (blue line). The main channel of the stream is indistinct but it is clear that the stream transports a high volume of water. It is in a good condition and utmost care must be taken to keep the impact on the stream to a minimum.

Figure 11: View of the seasonal stream 1. The stream flows through small holdings and consequently is degraded.

Figure 12: View of the Roodewal Small Holdings through which the pipeline will be installed (red line). This area is transformed.

Appendix B: Protected species on the site

Protected species on the site may not be limited to these species but these species have identified on and around the site. Additional sources should be consulted to confirm the presence of protected species.

Crinum bulbispermum
Orange River Lily/Oranjerivierlelie/Vleilelie

Protected in the Free State Province

National Red List Status: **Declining**

Method: **The species occurs along the seasonal stream 3 and 4. It is anticipated that due to the small footprint of the pipeline only a few will be affected. These must be transplanted to an area adjacent to the pipeline in suitable and similar habitat. Permits must be obtained for transplantation. Plants only flower for a short period after which they may be difficult to identify in which case an ecologist should be consulted.**

Appendix C: Likely invader weed species

Invader weed species in the pipeline route may not be limited to these species but these are considered to be the most likely and significant invaders to occur. Additional sources should be consulted to confirm invader weed species as well as the best method to eradicate them.

According to the Conservation of Agricultural Resources Act, No. 43 of 1983 any Category 1 declared plants must be controlled by the land user on whose land such plants are growing.

Cirsium vulgare
Scotch Thistle/Skotse Dissel

Type: Weed
Category: 1

Mechanical removal is effective to control this weed. Cutting should be done below soil level and no leaves should remain.

Xanthium spinosum
Spiny Cocklebur/Boetebos

Type: Weed
Category: 1

Mechanical removal by hand is effective to control this weed.

Several chemicals have also been registered for control: amitrole/simazine, bromoxynil, metribuzin, MCPA-K and 2,4-D(A).

Xanthium strumarium
Large cocklebur/Kankerroos

Type: Weed
Category: 1

Mechanical removal by hand is effective to control this weed. Cutting is not recommended as this leads to re-sprouting.

Several chemicals have also been registered for control: bromoxynil, metribuzin, cyanazine/atrazine, bendioxide, MCPB, MCPA-K and 2,4-D(A), (T), (I).

Argemone ochroleuca
Mexican Poppy

Type: Weed
Category: 1

Mechanical removal by hand is effective against this weed.

Several chemicals have also been registered for control: 2, 4-D, 2, 4-DB, dicamba, diuron, fluroxypyr, hexazinone, isoproturon, karbutilate, MCPA, picloram and terbutryn.

Solanum eleagnifolium
Silver-leaf Bitter Apple/Satansbos

Type: Wees
Category: 1

Chemical control is most effective for control of this weed. Garlon 4 (triclopyr) is the only registered herbicide for control.

Datura stramonium
Common Thorn Apple/Gewone stinkblaar

Type: Weed
Category: 1

Mechanical control is most effective. Pulling of plants and correct disposal of seed bearing plants is effective.

Chemical control is by means of a glyphosate spray

Datura ferox
Large thorn-apple/Grootstinkblaar

Type: weed
Category: 1

Mechanical removal by hand is effective for this weed.

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We provide our clients with a professional service and cost effective solutions to their environmental problems to conduct their activities, development or explore natural resources like minerals, surface and ground water, without adversely impacting on the environment.

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APPENDIX D4

Preliminary Design Report

MBWaP

MANGAUNG BULK WATER PROGRAMME

Maselspoort Recirculation Pipeline: Phase 1A
Preliminary Engineering Design Report
Second Submission

(Rev 1)

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bigen
Doing good while doing business

MANGAUNG
AT THE HEART OF IT ALL

November 2019

Client Reference: C273/G1 W1502
Consultant Reference: 2401-00-00
Project Name: Mangaung Bulk Water Programme (MBWAP)
Report Name: Maselspoort Recirculation Pipeline: Phase 1A
Compiled by:

Name	Signature	Date

Reviewed by:

Name	Signature	Date

Received and accepted by a duly authorised representative of the client

Client representative:

Name	Signature	Date

Document Status

Status	Date	Compiled	Reviewed	Date	Changes	Client
1st Submission	January 2017	G vd Merwe (BA)	L Biggs (BA); PA Cilliers (BA)	February 2017		G Fritz (MMM)
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Mangaung Metro Municipality

Maselspoort Recirculation Pipeline: Phase 1A

Preliminary Engineering Design Report

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List of Abbreviations

BAR	*Basic Assessment Report*
CIDB	*Construction Industry Development Board*
CPI	*Consumer Price Index*
DCVG	*Direct Current Voltage Gradient*
DWAS	*Department of Water and Sanitation*
EIA	*Environmental Impact Assessment*
GRP	*Glass Reinforced Pipe*
LCCA	*Life Cycle Cost Analysis*
MCC	*Motor Control Centre*
MGWAP	*Mangaung Metro Municipality Gariep Water Augmentation Program*
MMM	*Mangaung Metropolitan Municipality*
MRP	*Maselspoort Recirculation Pipeline*
NE	*North Eastern*
NPV	*Nett Present Value*
PED	*Preliminary Engineering Design*
PLC	*Programmable Logic Controller*
RoD	*Record of Decision*
SANS	*South African National Standards*
SCMP	*Supply Chain Management Policy*
VIP	*Ventilated Improved Pit*
WTP	*Water Treatment Plant*
WTW	*Water Treatment Works*
WWTP	*Waste Water Treatment Plant*
WWTW	*Waste Water Treatment Works*

EXECUTIVE SUMMARY

The re-use of water from two of Bloemfontein's largest Waste Water Treatment Works namely Bloemspruit- and North Eastern WWTW were identified as possible sources to supplement the Mangaung Metro Municipality bulk supply scheme. The re-use of water will increase the yield to Maselspoort WTW, with the aim to decrease the need for raw water transfer from the Caledon River via the Novo Transfer Scheme.

The holistic scope of the project includes the design and construction for the transfer of treated effluent from the North Eastern (NE) WWTW and Bloemspruit WWTW to Mockes Dam. The project has been sub-divided into four phases to ensure the effective design and management of the project as a whole. Upon Mangaung Metropolitan Municipality's (MMM's) decision and instruction, the four phases have each been assigned to a specific Consultant.

Bigen has been appointed by MMM to manage the integration of the respective phases. The scope of the project has been sub-divided and assigned to the various Consultants with Bigen responsible for Sub-Phase 1A defined as follows:

- Sub-Phase 1A: Treated effluent water pump station, and pipeline from NE WWTW at the Renosterspruit to the break pressure tank on the watershed to deliver 77Mℓ/day.

Various LCCA's were performed to determine the most cost effective pipeline sizing over a LCCA period of thirty (30) years. The LCCA outcomes propose the construction of a 1.1m diameter GRP (Glass Reinforced Pipe) pipeline from the NE WWTW at the Renosterspruit to the Break Pressure Tank inlet to finally deliver 77Mℓ/day.

The total estimated project value to complete Sub-Phase 1A is **R106 743 056.00 (Excl. VAT).** The indicated total construction cost also makes allowance for Contract Price Adjustment of 10% of the Sub-Total and a further 10% allowance of the Sub-Total for contingencies.

The Preliminary Engineering Design (PED) Report furthermore addresses design parameters and inputs, assumptions and proposed preliminary design outcomes pertaining specifically to Sub-Phase 1A as assigned to Bigen. The PED Report also addresses the design of the proposed treated effluent water pump station at NE WWTW.

1 GENERAL

1.1 Project Brief

Bigen were appointed by Mangaung Metro Municipality (MMM) to conduct the necessary consulting services for the bulk water transfer of treated water from the North Eastern (NE) Waste Water Treatment Works (WWTW) and Bloemspruit WWTW to Mockes Dam for the purposes of re-use at Maselspoort Water Treatment Works (WTW).

A first draft Preliminary Engineering Design (PED) Report was completed by Bigen in 2014 (Bigen Africa Services (Pty) Ltd, 2014). Since the submission of the first draft PED Report, the available re-use capacities; the proposed phasing; the pipeline route; as well as the pipeline sizing optimisations had to be re-visited and reviewed upon Client's instruction. Furthermore, upon MMM's decision and instruction, the project has been sub-divided into four (4) phases and the phases have been assigned to different Consultants.

Bigen has been instructed by MMM to manage the integration of the respective phases. The scope of the project has been sub-divided and assigned to the various Consultants with Bigen Africa responsible for Sub-Phase 1A defined as follows:

I. Sub-Phase 1A: Treated effluent water pump station, and pipeline from NE WWTW at the Renosterspruit to the break pressure tank on the watershed to deliver 77Mℓ/day.

The purpose of the revised PED Report is to address design parameters and inputs, assumptions and proposed preliminary design outcomes pertaining to Sub-Phase 1A as assigned to Bigen.

2 PHASING, LAYOUT AND PLANNING

Four (4) different design scenarios have been identified as alternative solutions to address the desired outcomes of the Maselspoort Recirculation Pipeline (MRP) project in its totality. The different design scenarios are analysed and reviewed in a separate PED Report: *Preliminary Engineering Design Report Maselspoort Recirculation Pipeline Scheme*.

A complete Life Cycle Cost Analysis (LCCA) was performed for the different identified scenarios and the outcomes of the LCCA's indicated Scenario 1 to be the most economically feasible option for further implementation in the designs of the MRP (Bigen Africa Services (Pty) Ltd, 2017). The defined scope and proposed route for Sub-Phase 1A is thus based on

the proposed scope as defined for Scenario 1 encapsulating the extent of the total MRP route.

Refer to Figure 1 below for a route layout of Scenario 1 (Bigen Africa Services (Pty) Ltd, 2017) with key route markers defined for further discussion.

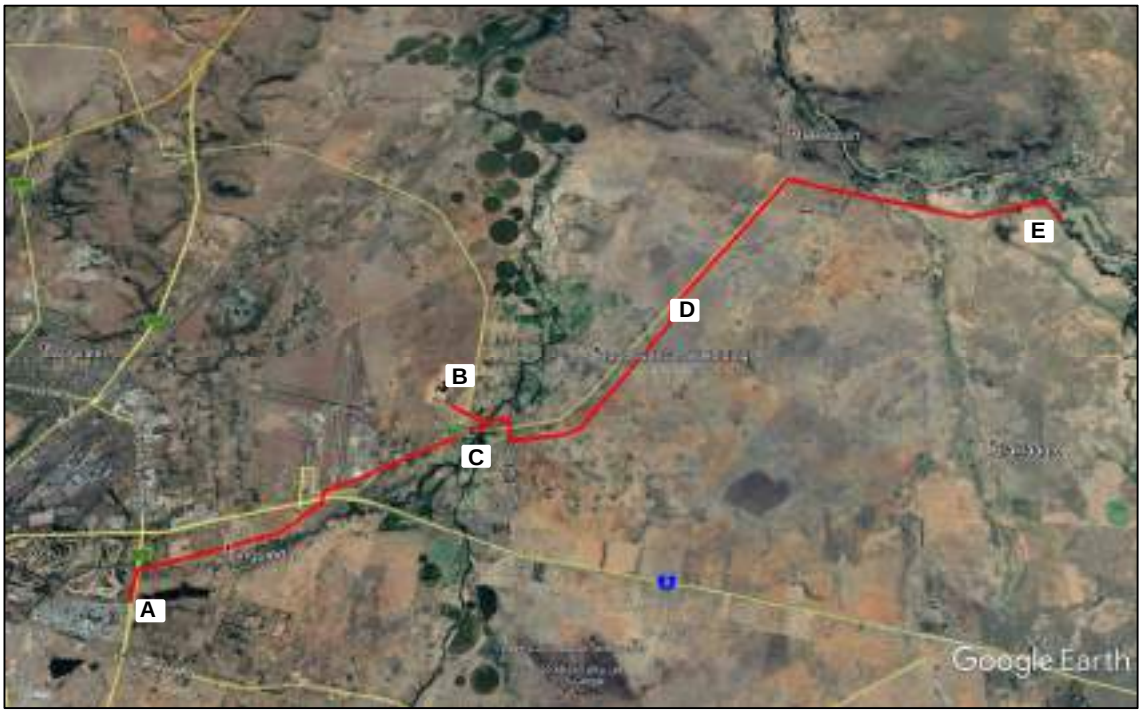


Figure 1: Maselspoort Recirculation Pipeline Route

The proposed ambit for Sub-Phase 1A includes the design of a new low lift pump station at the North Eastern WWTW (B) with a new pump line of a final capacity of 39Mℓ/day to pump treated effluent from the pump station to the watershed and proposed new break pressure tank (D). Three route options are provided with little to no variance in pipe material cost or size variances. These options affect various land owners of which not all have approved the construction of the proposed pipeline over their respective properties. The scope of the other phases falls outside the ambit of this report and is addressed in a separate report: *Preliminary Engineering Design Report Maselspoort Recirculation Pipeline Scheme* (Bigen Africa Services (Pty) Ltd, 2017).

2.1 Scope of Work

Sub-Phase 1A has been identified as the treated effluent pipeline from NE WWTW at the Renosterspruit (B) to the Break Pressure Tank inlet (D) to deliver a combined total 77Mℓ/day. The following scope and project deliverables have been identified as part of Sub-Phase 1A:

- The construction of a booster pump station at the NE WWTW (B);
- The lining of a balancing dam at the NE WWTW (B);
- The design, supply and installation of electric motors, pumps, pipes, valves and HMI's;
- The design, supply and installation of electrical supply, motor control centres and PLC's;
- The design, supply and installation of SCADA and fibre optic communication network;
- The construction of a 800mm GRP pumping main from NE WWTW (B) to the connection point (C) with a capacity of 39Mℓ/day (Already constructed);
- The construction of a pressure main from the connection point (C) to the break pressure tank inlet (D) with a capacity of 77Mℓ/day;
- The construction of valve-, scour and air-valve chambers and associated pipe works;
- The construction of a break pressure tank (D);
- Pipe jacking beneath the A40 road;
- River crossing through the Renosterspruit (C);
- Sleeve pipes for fibre optic cable network;
- Construction of a temporary HDPE water reticulation pipeline to residents adjacent to the rising main;
- Construction of a new water reticulation main diameter 90mm to 200mm; and
- Traffic management.

The details pertaining to the preliminary design elements as defined above will be addressed in the following section and in the remainder of the PED Report.

2.2 Programme

A first order programme has been compiled addressing timeframes and the proposed order of implementation for Sub-Phase 1A. Refer to Table 1 for the proposed preliminary implementation programme with the various project deliverables' commencement and completion dates indicated.

Table 1: Proposed Preliminary Programme for Sub-Phase 1A

Task Name	Start Date	Finish Date
Phase 1A: Pipeline-NEWWTW to Pressure Tank (Bigen)	14-09-16	13-08-19
Additional Services	14-09-16	13-12-19
Professional Services	14-09-16	22-11-21
Design	14-12-19	31-08-20
Documentation and Procurement	01-09-20	23-11-20
Contract Administration & Inspection	24-11-20	25-10-21
Close-out	26-10-21	22-11-21
Construction Monitoring	24-11-20	25-10-21
Construction Works	24-11-20	25-10-21

Based on the above table the commencement date was scheduled for 14 September 2016 with implementation readiness of Sub-Phase 1A estimated to be 31 August 2020.

2.3 Capital Costs and Apportionments

First order construction and monitoring costs have been completed in order to determine the estimated implementation costs for Sub-Phase 1A. Refer to Table 2 for a summary of the total estimated construction cost for Sub-Phase 1A.

Table 2: Estimated Construction Cost for Sub-Phase 1A

Bill No.	Description	Amount
1	PRELIMINARY AND GENERAL	8,735,600.00
2	PROVISIONAL SUMS AND PRIME COST ITEMS	1,743,500.00
3	DAYWORKS	520,100.00
4	TEMPORARY WORKS FOR CONSTRUCTION	4,757,525.00
5	SITE CLEARANCE	721,105.00
6	FENCING	911,325.00
7	EARTHWORKS (PIPE TRENCHES)	3,103,774.78
8	GABIONS AND PITCHING	350,475.00
9	MEDIUM PRESSURE PIPELINES	38,755,934.32
10	AIR VALVES	255,400.00
11	SCOUR VALVES	720,000.00
12	CABLE DUCTS	885,734.58
13	BEDDING (PIPES)	3,395,474.38
14	SUBSOIL DRAINAGE	297,760.00
15	PRESSURE BREAK CHAMBER	182,007.30
16	AIR VALVE CHAMBERS	192,373.40
17	SCOUR VALVE CHAMBERS	1,018,242.00

18	PIPE JACKING AND PIPE BORING	1,130,000.00
19	POND LINING	6,477,577.00
20	PUMP STATION	10,227,954.88
	Sub-Total	84,381,862.63
	Provisional sum: Allowance for Contract Price Adjustment (10% of Sub-Total)	8,438,186.26
	Sub-Total	92,820,048.89
	Provisional sum: Allowance for Contingencies (15% of Sub-Total)	13,923,007.33
	Total Construction Cost	106,743,056.23
	Value Added Tax at 15%	16,011,458.43
	Total Amount of Tender Carried Forward to Form of Offer and Acceptance	122,754,514.66

The estimated total construction costs for completion and implementation of Sub-Phase 1A of the MRP is estimated to be R 106 743 056.23 (VAT Excl.).

3 BULK AND LINK SERVICES

The following section will describe the scope of work as identified and pertaining to Sub-Phase 1A. The preliminary design proposals and outcomes will be addressed in line with the following identified scope of work:

- Buffer Pond at NE WWTW;
- Booster Pump Station at NE WWTW;
- ±5km Pipeline from NE WWTW to Break Pressure Tank Inlet;
- Break Pressure Tank;
- River Crossing at Renosterspruit; and
- Fibre Optic Communication.

3.1 Buffer Pond

There is an existing buffer pond at the North Eastern WWTW with a capacity of 20Mℓ. The existing buffer pond needs to be concrete-lined and minor alterations to the existing pond outlet structure and by-pass are required and must be allowed for in the detail design stage. Investigations have indicated that no alterations or upgrades at the NE WWTW's existing chlorine contact tank are required. The chlorine contact tank will enable the transfer of the

final effluent into the existing buffer pond, to be utilised as a balancing dam, before pumped to Mockes Dam.

3.2 Pump Station

The planned capacity at the North Eastern WWTW is 45Mℓ. Taking losses into account the pumps will be sized to enable a transfer of 39Mℓ/day over a 20 hour pump period. The required transfer capacity will be further analysed and finalised during the detail design in order to size the pump station based on the most accurate representation of the amount of treated effluent that needs to be transferred to Mockes Dam.

Transferring water from the North Eastern WWTW would require a low lift, high flow booster pump station. The pump station layout will consist of a concrete lined balancing dam with a minimum four (4) hour storage volume, a pump station building and standby duty pump configuration with a capacity of pumping 39Mℓ/day.

The pumps will be operated at 20h pumping time and 4h shut-down. Preliminary design calculations indicate that the drive power requirements for the transfer of 0.542m^3/sec at 24m head will be 161kW.

The pump station will be located inside the perimeter fence of the NE WWTW and included into the general WWTW operations. The location will enable the Client to better manage and maintain all associated equipment as fewer resources will be required for maintenance on localised capital assets.

3.3 Pipeline

3.3.1 Pipeline Sizing

The outcomes of the *Preliminary Engineering Design Report: Maselspoort Recirculation Pipeline* indicated Scenario 1 to be the most economically feasible option for implementation (Bigen Africa Services (Pty) Ltd, 2017). The LCCA's performed for the purposes of the above-mentioned study could thus be further expanded in this section to focus specifically on the required outcomes for Sub-Phase 1A.

The first section of pipeline from NE WWTW (B) to the connection point (C) should be designed to deliver 39Mℓ/day and the section from the connection point (C) to the watershed and break pressure tank inlet (D) should be designed to deliver 77Mℓ/day. In order to determine the optimum diameter for the pipeline a Life Cycle Cost Analysis (LCCA) was performed for a range of diameters focusing on the section from the connection point (C) to

the watershed and break pressure tank inlet (D). A LCCA was performed for the following range of diameters: Ø1m; Ø1.1m; Ø1.2m; and Ø1.3m.

The following assumptions were applied in the execution of the diameter sizing LCCA:

- Consumer Price Index (CPI) at 6%;
- LCCA period of 30 Years;
- Pipeline maintenance taken as 0.5% of capital cost per year;
- Pump station maintenance taken as 6.6% of mechanical/electrical capital cost per year (i.e. pump lifetime of 15 years);
- Pumping time of 20 hours per day;
- Pipeline material is assumed to be Glass Reinforced Pipe (GRP);
- LCCA based on capital cost, Operation and Maintenance (O&M) costs and electricity costs (all Nett Present Value (NPV)).

The LCCA outcomes for the various specified diameters are indicated in Table 3 below.

Table 3: Life Cycle Cost Analysis Outcomes for Scenario 1

	Electricity	Construction Cost NPV						Maintenance		Operations		
Pipe Diameter (mm)	Electricity NPV	Connection - Watershed	NE - Connection	Bloemspruit - Connection	North Eastern Pump Station	Additional Construction Cost	Total Construction Cost	Pipeline Maintenance Costs	Pump Station Maintenance Cost	Operational Costs	Water Savings Cost NPV	Total NPV
	i	ii	iii	iv	v	vi	vii	viii	ix	x	xi	xii
1000	77 853 717.18	40 002 628	963 905	56 110 303	6 091 747	4 500 000	107 668 582	14 561 525	12 189 585	7 350 000	5 132 415 600	**219 623 409**
1100	71 871 501.03	43 923 728	963 905	56 110 303	5 960 419	4 500 000	111 458 355	15 149 690	11 926 799	7 350 000	5 132 415 600	**217 756 346**
1200	68 434 579.13	48 224 030	963 905	56 110 303	5 884 969	4 500 000	115 683 206	15 794 736	11 775 823	7 350 000	5 132 415 600	**219 038 343**
1300	66 363 040.86	52 928 819	963 905	56 110 303	5 839 493	4 500 000	120 342 518	16 500 454	11 684 825	7 350 000	5 132 415 600	**222 240 838**

The method in determining the total Nett Present Value (NPV) for the Life Cycle Cost Analysis (LCCA) over a period of thirty (30) years will be discussed with reference to the various elements' numbering in the above table.

The total electricity cost (i) for each diameter size over a period of thirty (30) years is indicated in the above table. A pump size is determined for the respective diameters based on the amount of energy required for meeting the various duty points. The forecasted pumping time for each year is determined for the following time slots: peak-; standard-; and off-peak times for both winter and summer months. The respective times as determined are further applied to the various time slots' tariffs along with the pump size to determine the total electricity cost (i).

The construction cost for the pipeline from the connection point where the treated effluent gravity line ties into the pump line after the new low lift pump station to the watershed (ii) in the above table is derived based on a unit cost of GRP pipeline per meter length as obtained

from the manufacturers for the different pipe diameters. The respective cost for additional couplings for each diameter size is also taken into account. The excavation and associated backfilling costs are calculated based on the various diameter sizes and an assumed unit rate for excavation and backfilling applied in order to determine the total construction cost for the respective diameter sizes. Different valve installations and valve chamber construction costs are also taken into account to determine the total construction cost for the pipeline from the connection point to the break pressure tank (ii).

The construction cost for the pipeline from North Eastern WWTW (iii) to the connection point where the gravity line ties into the pump line is calculated based on the unit cost for the supply and delivery of a 800mm diameter GRP pipe. Other additional costs for specific elements required along the pipeline route including air valves, scour valves, isolating valves, chambers, etc. are also included in the calculation. The construction cost for the pipeline from Bloemspruit WWTW to the connection point (iv) is calculated similarly by applying the unit cost for the supply and delivery of a 800mm diameter GRP pipe to the required pipeline length.

The construction cost for the new low lift pump station (v) is calculated based on a first order estimation including civil and structural costs; pipework and valves; and electrical works including the Motor Control Centre (MCC) and Programmable Logic Controller (PLC). The total estimated construction cost for the pump station (v) also includes a mechanical cost estimation based on a fixed mechanical operation cost per kW for the required pump sizes for the respective diameter sizes.

The additional construction cost (vi) includes a fixed estimated construction cost for the buffer pond and the break pressure tank. The total construction cost (vi) is merely a summation of the cost of laying a pipeline from the connection point to the watershed (ii); the cost of the pipeline from North Eastern WWTW to the connection point (iii); the pipeline from Bloemspruit WWTW to the connection point (iv); the North Eastern WWTW pump station (v); and the additional construction costs (vi).

The total pipeline maintenance costs (viii) is calculated based on the stated assumed pipeline maintenance cost of 0.5% as a percentage of the total capital cost per year. This percentage is applied to the total pipeline capital cost (ii-iv) for a period of thirty (30) years in order to determine a maintenance cost over the total LCCA period for the respective diameter sizes.

The total pump station maintenance costs (ix) is calculated by applying the stated assumed pump station maintenance cost of 6.67% as a percentage of the total capital cost per year to the estimated pump station capital cost (v) for the respective diameter sizes over an LCCA period of thirty (30) years.

The total operational cost (x) for each diameter size is calculated based on an assumed yearly operational cost (NPV) for the following operational elements: a system operator; an operator's vehicle; and an operator's equipment. The total of the assumed yearly operational cost for the above elements is applied to the total LCCA period of thirty (30) years to determine the total pump station operational cost (x) for each diameter size.

The total implementation cost (xii) is determined as a summation of the electricity costs (i); the total construction costs (vii); the pipeline maintenance costs (viii); the pump station maintenance costs (ix); and the operational costs (x). From the complete LCCA and Table 3 above it can thus be concluded that the most cost effective option for the Maselspoort Recirculation Pipeline project is for the implementation and installation of a 1.1m diameter pipe for the pipeline section from the connection point to the break pressure tank. The outcome of the LCCA is also graphically presented in Figure 2 below.

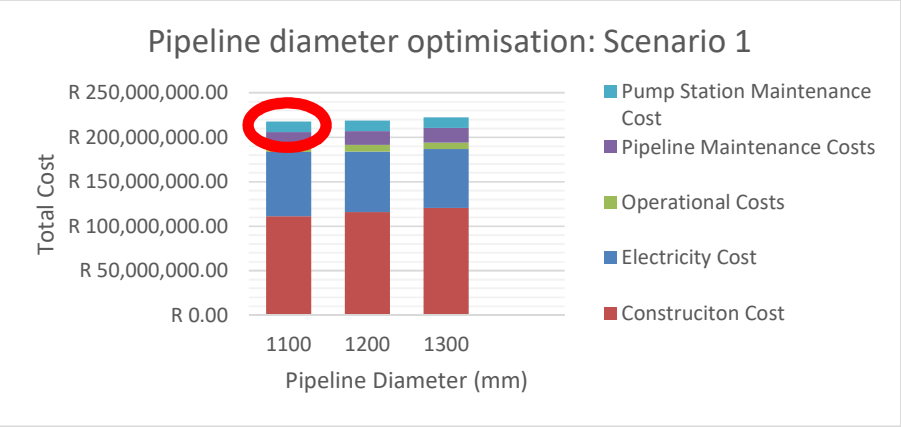


Figure 2: Life Cycle Cost Analysis Outcomes for Scenario 1

The above calculations thus indicate that the installation of a 1.1m Ø pipeline for the section from the connection point at North Eastern WWTW to the break pressure tank is the most cost effective option for the pipeline and, depending on Client approvals, further detail designs will be based on this optimum diameter sizing. The pipeline will also be further optimised during detail design to utilise the existing static head maximally for energy saving related to booster pumping.

3.3.2 Pipeline Material

The client requested that GRP (Glass Reinforced Pipe) technology be use for low pressure and high flow requirements. In order to determine which material will be most effective in the application of the pipeline material a cost comparison between steel and GRP pipes was performed.

As the steel price in South Africa is currently very sensitive to the political and economic environment the steel prices cannot be accurately determined and fixed for the time of tender release. To make a comparison between steel and GRP pipes, quotations were requested for both pipe materials in order to make a cost comparison based purely on material costs. The latest revised quotations for both steel and GRP pipes were requested January 2017. Refer to Table 4 for a cost comparison of a 1.1mØ GRP and 1.1mØ steel pipes.

Table 4: Pipe Material Costs (January 2017)

GRP Pipe: 1.1mØ		**Quantity**	**Rate**	**Total**	
Supply and Deliver Rate	m	4 664	4 350	R	20 288 400
Additional GRP Couplings	no	58	2 527	R	147 324
			Total	**R**	**20 435 724**
			GRP Rate Per Meter (R/m)	R	4 382
Steel Pipe: 1.1mØ		**Quantity**	**Rate**	**Total**	
Supply and Deliver Rate	m	4 664	4 275	R	19 938 600
Welding	no	466	500	R	233 200
DCVG Survey	sum	1	80 000	R	80 000
Design, Installation and Commissioning of CP and AC Mitigation System	sum	1	4 500 000	R	4 500 000
			Total	**R**	**24 751 800**
			Steel Rate Per Meter (R/m)	R	5 307

As for both pipe materials (of the same diameter) the trench preparations-; excavations-; bedding-; backfilling-; and valve costs will be the same, the above table thus only addresses the variable costs in the installation for the two different pipe materials. The biggest cost difference can be awarded to the difference in the supply and deliver rate of the different materials. For the GRP pipe it is assumed that additional couplings will be required every 80m across the length of the pipe route. Furthermore, for the installation of GRP pipes no additional installation factors need to be taken into account.

For the installation of a steel pipe various additional factors need to be accounted for including the welding cost to join the 12m pipe lengths. The amount of welds is thus calculated for every 12m across the pipeline route length and an additional 20% welds accounted for additional fittings and/or bends. The welding rate is difficult to predict as this will vary considerably with different contractors.

Cost factors consider with the installation of a steel pipe includes a DCVG (Direct Current Voltage Gradient) survey which will need to be conducted after the installation of the steel pipes. The design, installation and commissioning of a CP and AC mitigation system also needs to be considered with the installation of a steel pipeline. The cost of such a system can vary considerably based on the different grounding techniques required for different unique environments. A conservative cost for both the DCVG survey as well as the CP and AC mitigation system is assumed for the purposes of the cost comparison.

The total installation cost for both pipes are redirected to an installation cost per meter for comparison. It should be noted that this cost per meter only includes the varying elements between the two pipe materials and the actual rate per meter will be considerably higher once excavation-; bedding-; backfilling-; and valve costs are also included. Table 4 thus indicates that the installation cost (R/m) for the installation of GRP pipe is the most cost effective option. This outcome is also based on a very conservative welding-; DCVG survey-; and CP and AC mitigation system cost for the installation of a steel pipe and should the actual cost of these elements be higher than predicted, the difference in rates will be even more favourable for the installation of a GRP pipe.

3.3.3 River Crossing

The pipeline from the North Eastern WWTW (B) will follow two optional routes as indicated in Figure 3 below.

Figure 3: Pipeline Route: Road and River Crossing

As indicated in the above image the pipeline will follow for route option 1 from the North Eastern WWTW (B) to a point where the A40 road needs to be crossed (F) by means of pipe jacking. The designed pipeline from North Eastern WWTW is a GRP pipe of 800mm Ø but for the section of the road crossing the pipe material will be altered to a 800mm Ø steel pipe. Immediately after the road crossing the pipeline route will bend in the direction of Maselspoort where the pipeline will need to cross the river (G) where a river crossing structure needs to be designed.

The proposed river crossing (G) will be designed to include the installation of two (2) 800mm Ø steel pipes. There is an existing water main which currently crosses over the bridge and in order to make the exercise of the river crossing more economically feasible it is proposed that this 200mm Ø steel pipe also be included in the design of the river crossing. Refer to Figure 4 below for a schematic representation of the preliminary design of the river crossing.

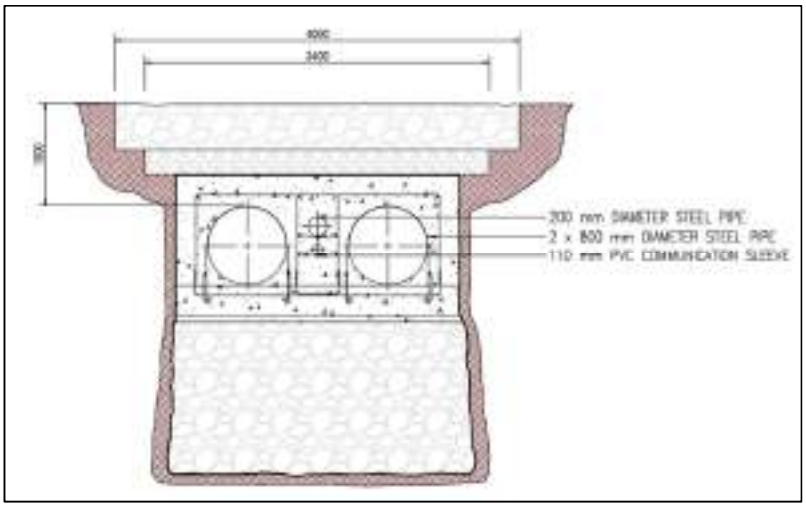


Figure 4: Schematic Preliminary Design of the River Crossing

From the image above it can be seen that the two (2) 800mm Ø steel pipes are designed to be placed a distance of 1m below the river bed. The 200mm Ø steel water pipe will run between the two (2) 800mm Ø steel recirculation pipelines. The reason for the installation of two (2) recirculation pipelines is to make provision for future maintenance on the pipeline. It is proposed that the pipes should be concrete encased and will be covered by two (2) rip-rap layers and the entire river crossing structure enclosed by a protective Sealmac Filament Polyester Paving Fabric.

For route option 2 from the North Eastern WWTW (B) to a point (E^1) where Renosterspruit needs to be crossed by means of river crossing. The designed pipeline from North Eastern WWTW is a GRP pipe of 800mm Ø but for the section of the river crossing the pipe material will be altered to a 800mm Ø steel pipe. This design will be similar to that described in option 1.

3.3.4 Pipeline Route Specifications

The final optimised and proposed pipeline route for Sub-Phase 1A is summarised in this section.

The pipeline from the NE WWTW (B) to the connection point (C^1) should be designed for a capacity of 39Mℓ/day. This section of pipeline has been optimised for a design of 800mm Ø GRP pipe for a length of approximately 1 110m from the NE WWTW to the connection point where the proposed future pipeline from Bloemspruit WWTW will connect to the pipeline. After this connection point the pipeline should have a capacity of 77Mℓ/day combining the

39Mℓ/day capacity from the NE WWTW and the 38Mℓ/day capacity from Bloemspruit WWTW.

After the connection point the A40 road needs to be crossed by means of pipe jacking. The pipe jacking should be designed for a 800mm Ø steel pipe for a length of approximately 70m. After the river crossing the pipeline material will revert back to GRP pipe but the size should increase to a 1100mm Ø pipe to accommodate the 77Mℓ/day capacity for an approximate length of 4600m up to the point of the designed break pressure tank (C).

3.4 Break Pressure Tank

The break pressure tank will be placed at the watershed (C) at the point where the rising pipeline from NE WWTW (B) starts to gravitate. The break pressure tank will be designed and sized to ensure that the gravity pipeline from the watershed (C) to Mockes Dam (E) will not run dry with the necessary valve closure measurements in place.

The break pressure tank will be placed a distance from the road to ensure that the structure won't be constructed within the road reserve and rather within a land owner's property on the watershed.

The outlet at points at Mockes Dam and Maselspoort respectively needs to be designed to be controlled outlets to restrict the maximum flow velocity. Free flow conditions will occur after the break point (C) due to the topographical layout of the pipeline route and need to be mitigated to ensure that no damage occurs to the pipeline due to these conditions.

3.5 Fibre Optic Communication

Provision need to be made along the entire pipe length for fibre optic communication cable. Sleeves will be installed in the trench excavations above the pipe with access points located at the existing air- and scour valve chambers.

4 NATURAL ENVIRONMENT

4.1 Topography and Surveys

The proposed routes can be classified as average sloped with two high points of which the first one will be the Critical Point determining the hydraulic gradient. For the purpose of the preliminary designs the LIDAR survey completed by MMM was utilised. A detailed strip survey of the complete pipeline route along the A40 has been completed for the purposes of detail designs with the two alternative routes outstanding.

4.2 Geological and Geotechnical Aspects

A geotechnical investigation for the holistic project and Maselspoort Recirculation Pipeline in its totality has been completed by the consulting engineering firm, SMEC. The report thus also addressed the geotechnical aspects as pertaining to Sub-Phase 1A of the project. The outcome of the investigation and the complete Geotechnical Investigation Report is included as an Annexure at the end of the report (Annexure F1).

Preliminary slope stability calculations have also been performed yielding a stability safety factor greater than 1 which is acceptable for the purposes of the pipeline trench excavations. The slope stability calculations will be addressed in more detail during the detail design phase.

4.3 Environmental and Cultural/Historical Issues

The holistic project and Maselspoort Recirculation Pipeline in its totality has been identified for a BAR (Basic Assessment Report) and was completed by MDA Consultants. The BAR will form part of a combined application for bulk projects identified. The required Environmental Impact Assessment (EIA) has been completed for the project as a whole and thus also addresses the environmental aspects of the project pertaining specifically to Sub-Phase 1A of the project. The EIA is included in the report as Annexure F2 together with the Record of Decision (RoD).

A separate application has been done for the alternative routes. At present this application is in process and will be submitted in due course.

4.4 Surface and Subsurface Rights

Farmers and consumers downstream of the proposed catchment point for the pipeline have allocated water rights based on the natural run-off of Bloemspruit and Renosterspruit as listed with the Department of Water and Sanitation (DWAS). The additional run-off produced by the WWTWs is for this reason not allocated to the water users and is available for re-use by the Municipality.

At present obtaining approval from all land owners for the construction of this pipeline over their properties proof to be difficult with a reluctance of owners to complete required approval forms.

Though the general response is that owners are not against the implementation of this re-use pipeline, the acceptance of such development on their property seems to be of a concern.

5 CONTRACT STRUCTURE

5.1 Overall Contract Structure

The General Conditions of Contract applicable to this Contract shall be the Conditions of Contract for Plant and Design – Build, for Electrical and Mechanical Plant, and for Buildings and General Engineering Works, Designed by the Contractor: FIDIC (Yellow Book) First Edition, 1999.

5.2 Construction Methods

Open trench excavation methods will be used for the construction of the pipeline. All road crossings to be completed by pipe jacking.

The size of the pipe will require the use of side booms in order to ensure pipes do not get damaged. This equipment will require 20m wide construction servitude.

Service owners such as the Department of Police Roads and Transport need to be consulted in order to determine minimum requirements for services constructed within the servitude of the service owners.

5.3 Sub-Contracting

Sub-Contractors will be utilised for the pipe jacking and other specialist services. Depending on the skill and resources of the appointed Contractors the mechanical and electrical works at the pump station will also be Sub-Contracted.

5.4 Procurement

MMM Supply Chain Management Policy (SCMP) will be applied in the procurement of a civil Contractor according to the CIDB (Construction Industry Development Board) guidelines for a Contractor with a CIDB grading of 8CE or higher through an open public tender process.

6 CONCLUSION AND RECOMMENDATIONS

The scope of the project includes the design and construction for the transfer of treated effluent from the North Eastern (NE) WWTW and Bloemspruit WWTW to Mockes Dam.

The scope of the project has been sub-divided into four phases with different Consultants appointed by the Client for the execution of each phase. The ambit of this PED report specifically addresses the preliminary designs for Sub-Phase 1A as appointed to Bigen.

Recommendations:

6.1 Scope of Works

Sub-Phase 1A to include the construction of a treated effluent water pump station, and pipeline from NE WWTW at the Renosterspruit to the break pressure tank, to deliver 77Mℓ/day.

6.2 Land Owner Consent

Alternative survey methods may not require owner consent to complete topographical surveys for detail design purposes. However owner consent will be required to construct the pipeline and register a servitude in the name of the Municipality. It's recommended that these matters be resolved closer to the time of tender. Should mutual agreement fail to be reached, the alternative would be expropriation.

6.3 Environmental Authorisation and Water Use Licence.

An Environmental Authorisation was issued for the original pipeline route adjacent to the A40 road between Bloemfontein and Moches Dam. This authorisation has been extended till 2020.
An additional application is in process for the two alternative routes. This should include any and all requirements for the temporary transfer of water through an open channel and natural streams.

7 REPORT DRAWINGS

Table below indicates a list of drawings of the project included for the purposes of the PED Report. The drawings are included in Annexure F3.

Table 5: List of Drawings

DRAWING NO.	DESCRIPTION
	CIVIL
2401.01.GZA.01.A001	DRAWING REGIOSTER AND LOCALITY MAP
2401.01.GZA.01.A003	PROJECT NAME BOARD
2401.01.GZA.01.A004	ENGINEER'S SITE OFFICE
2401.01.GZA.01.A005	SITE OFFICE FURNITURE
	PIPELINE
2401.01.GZA.05.S001	LAYOUT AND DRAWOFFS
2401.01.GZA.03.D001	PIPE JACKING
2401.01.GZA.03.D002	TYPICAL TRAFFIC CONTROL
2401.01.GZA.05.L001	LAYOUTS AND LONGSECTION 1:1000 (WITH PHOTO)
2401.01.GZA.05.L002	LAYOUTS AND LONGSECTION 1:1000 (WITH PHOTO)
2401.01.GZA.05.L003	LAYOUTS AND LONGSECTION 1:1000 (WITH PHOTO)
2401.01.GZA.05.L004	LAYOUTS AND LONGSECTION 1:1000 (WITH PHOTO)
2401.01.GZA.05.L005	LAYOUTS AND LONGSECTION 1:1000 (WITH PHOTO)
2401.01.GZA.05.L006	LAYOUTS AND LONGSECTION 1:1000 (WITH PHOTO)
2401.01.GZA.05.L007	LAYOUTS AND LONGSECTION 1:1000 (WITH PHOTO)
2401.01.GZA.05.L008	LAYOUTS AND LONGSECTION 1:1000 (WITH PHOTO)
2401.01.GZA.05.L009	LAYOUTS AND LONGSECTION 1:1000 (WITH PHOTO)
2401.01.GZA.05.L010	LAYOUTS AND LONGSECTION 1:1000 (WITH PHOTO)
2401.01.GZA.05.X001	LAYOUTS AND LONGSECTION 1:1000 (WITH PHOTO)
2401.01.GZA.05.D001	RIVER CROSSING DETAIL AT RENOSTERSPRUIT
2401.01.GZA.05.D002	TYPICAL PIPELINE TRENCH CROSS-SECTIONS AND MARKERS
2401.01.GZA.05.D003	GENERAL DETAILS
2401.01.GZA.05.D004	LINING AT PIPE JOINTS
2401.01.GZA.05.D005	SCOUR VALVE CHAMBER PLAN VIEW
2401.01.GZA.05.D006	SCOUR VALVE CHAMBER SECTION A-A
2401.01.GZA.05.D007	SCOUR VALVE CHAMBER COVER SLAB DETAILS
2401.01.GZA.05.D008	BREAK PRESSURE CHAMBER
2401.01.GZA.05.D009	AIR VALVE CHAMBER TYPE 1 WITH EART ANCHOR
2401.01.GZA.05.D010	AIR VALVE CHAMBER TYPE 2

2401.01.GZA.05.D011	TYPICAL DRAWING FABRICATED MANHOLE COVER
2401.01.GZA.05.D012	TYPICAL VALVE CHAMBERS
2401.01.GZA.05.D013	TRUST BLOCK DETAILS
2401.01.GZA.05.F001	SCOUR VALVE CHAMBER FITTING LIST
2401.01.GZA.05.F002	AIR VALVE CHAMBER 1 FITTING LIST
2401.01.GZA.05.F003	AIR VALVE CHAMBER 2 FITTING LIST
2401.01.GZA.17.D001	STOCK PROOF FENCE 1.2M
2401.01.GZA.17.D002	SECURITY FENCE 1.8M GENERAL DETAILS
	PONDS
2401.01.GZA.14.D001	BUFFER POND: POND WALL DETAILS
2401.01.GZA.14.D002	BUFFER POND: POND FLOOR DETAILS
	PUMP STATION
2401.01.GZA.14.U001	COLUMN BASE LAYOUT
2401.01.GZA.14.U002	BASE LAYOUT
2401.01.GZA.14.U003	GROUND FLOOR LAYOUT
2401.01.GZA.14.U004	RING BEAM LAYOUT
2401.01.GZA.14.X001	SECTIONS SHEET 1
2401.01.GZA.14.X002	SECTIONS SHEET 2
2401.01.GZA.14.X003	SECTIONS SHEET 3
2401.01.GZA.14.X004	SECTIONS SHEET 4
2401.01.GZA.14.X005	SECTIONS SHEET 5
2401.01.GZA.14.X006	SECTIONS SHEET 6
	BUILDING
2401.01.GZA.16.U001	RECIRCULATION PUMPSTATION ELEVATIONS
2401.01.GZA.16.U002	RECIRCULATION PUMPSTATION EARTHWORKS AND PAVING
2401.01.GZA.16.U003	RECIRCULATION PUMPSTATION PLAN VIEW AND SECTIONS

8 ANNEXURES

8.1 Annexure F1 Geotechnical Investigation Report

8.2 Annexure F2 Record of Decision and Extension

8.3 Annexure F3 Drawings

9 BIBLIOGRAPHY

Bigen Africa Services (Pty) Ltd. (2014). *Bulk Water Supply To The Greater Bloemfontein Area From Gariep Dam: Pre-Feasibility Study Draft.*

Bigen Africa Services (Pty) Ltd. (2014). *Maselspoort Recirculation Pipeline Preliminary Design Report (Draft 1).*

Bigen Africa Services (Pty) Ltd. (2016). *Mangaung Metropolitan Municipality (MGWAP) Demand Analysis Report.*

Bigen Africa Services (Pty) Ltd. (2016). *Mangaung Metropolitan Municipality Re-Use of Effluent: Re-Use Pipeline and Mockes Dam Volume Balance Feasibility Study.*

Bigen Africa Services (Pty) Ltd. (2017). *Preliminary Engineering Design Report Maselspoort Recirculation Pipeline Scheme.*

ANNEXURE F1

GEOTECHNICAL INVESTIGATION REPORT

ANNEXURE F2

RECORD OF DECISION AND EXTENSION

ANNEXURE F3

DRAWINGS

Information on the

Preliminary Design

Specific to the current project

EXECUTIVE SUMMARY
The re-use of water from two of Bloemfontein's largest Waste Water Treatment Works namely Bloemspruit- and North Eastern WWTW were identified as possible sources to supplement the Mangaung Metro Municipality bulk supply scheme. The re-use of water will increase the yield to Maselspoort WTW, with the aim to decrease the need for raw water transfer from the Caledon River via the Novo Transfer Scheme.

The holistic scope of the project includes the design and construction for the transfer of treated effluent from the North Eastern (NE) WWTW and Bloemspruit WWTW to Mocke's Dam.

The proposed section of pipeline associated with the current project will connect to sections of pipeline of with the EA was already obtained. The pipeline associated with the existing EA will connect the NE WWTW with Mocke's Dam. It is proposed that a 1.1m diameter Glass Reinforced Pipe be constructed. Note that sections at the water crossings may entail the construction of a different diameter pipeline.

The current document address design parameters and inputs, assumptions and proposed preliminary design outcomes pertaining specifically to the current proposed pipeline section.

Alternative routes are being investigated, as obtaining approval from all the land owners for the construction of the approved pipeline over their properties are complex.

1 GENERAL

1.1 Project Brief

Bigen were appointed by Mangaung Metro Municipality (MMM) to conduct the necessary consulting services for the bulk water transfer of treated water from the North Eastern (NE) Waste Water Treatment Works (WWTW) and Bloemspruit WWTW to Mocke's Dam for the purposes of re-use at Maselspoort Water Treatment Works (WTW).

The purpose of the current report is to address design parameters and inputs, assumptions and proposed preliminary design outcomes pertaining to the section of pipeline as indicated in the map below.

Map 1: Routes to be assessed as part of the current project.

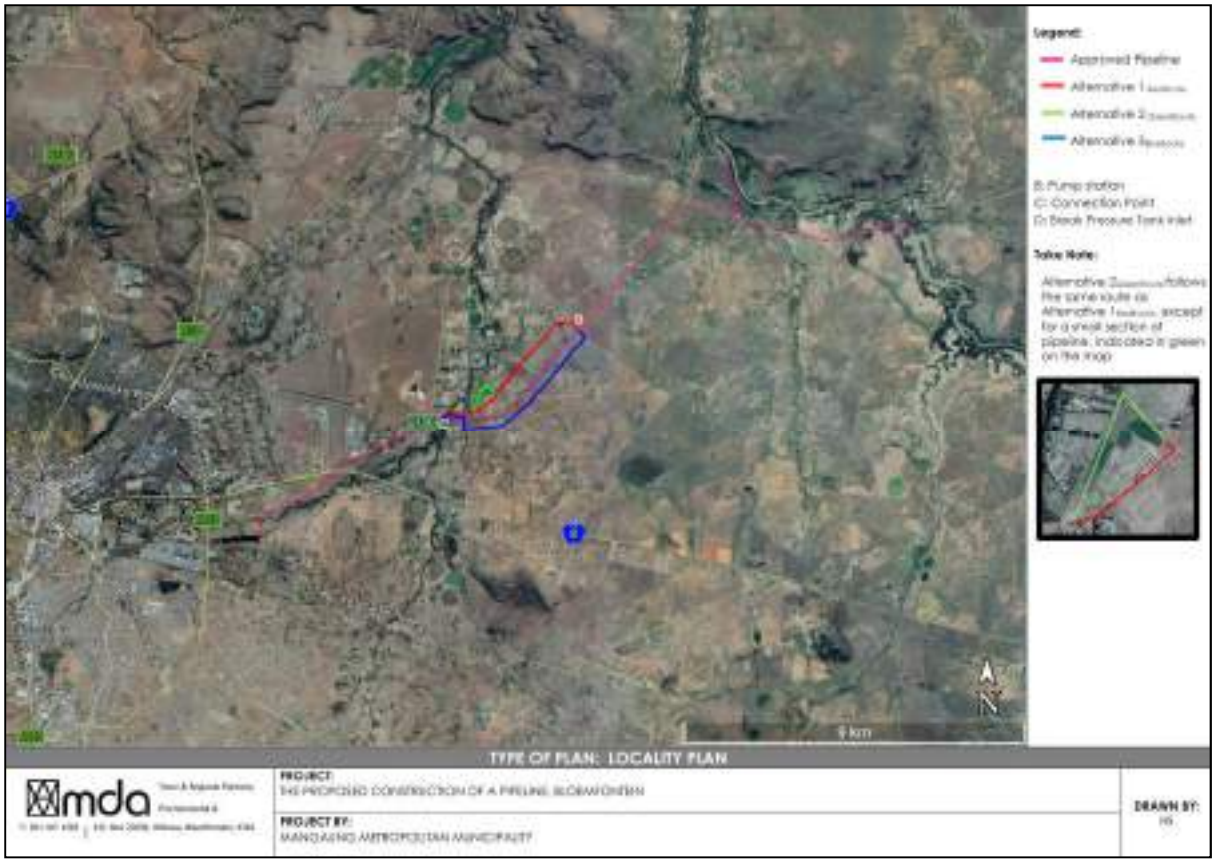
2 PHASING, LAYOUT AND PLANNING

An EA was obtained for the construction of a pipeline from the NE WWTW to Mocke's Dam (Map 2). The current project entails the re-evaluation of the pipeline route to be followed for a certain section of the approved pipeline. Refer to Map 1 for an indication of the proposed route layout associated with the current project.

Map 2: Maselspoort Recirculation Pipeline Route (EA received for pipeline indicated on map).

The proposed ambit for the current projects includes the design of a pipeline of a final capacity of 29 Mℓ/day in order to transfer treated effluent from the NE WWTW to Mocke's Dam. The three route options are provided with little to no variance in pipe material cost or size variances. Refer to Map 1 for more information on the proposed pipeline route alternatives.

The proposed ambit for the current project includes the design of a new pipeline (from Point C to Point D on Map 3) to transfer treated effluent from the pump station (see B on Map 3) to the watershed and the proposed new break pressure tank (D). Three pipeline route alternatives are associated with the current project. These alternatives have little to no variance in pipe material cost or size variances.



Map 3: Section of the Maselspoort Recirculation Pipeline Route – alternative layout to be assessed as part of the current project. Pump station (B); Connection Point (C); Watershed and break pressure tank inlet (D).

2.1. Scope of Work

The current project focusses on the construction of a section of pipeline as indicated in Map 1. The pipeline will connect to a pipeline that will transfer treated effluent water that originates from the NE WWTW (EA obtained for the said project). The pipeline associated with the current project will connect to an already approved pipeline that will transfer the water towards Mocke's Dam (connection will take place at the proposed Break Pressure Tank Inlet).

The following scope and project deliverables have been identified as part of the current project:

- The design and installation of pipes, valves and HMI's
- The design, supply and installation of SCADA and fibre optic communication network
- The construction of valve-, scour and air-valve chambers and associated pipe works
- Pipe jacking
- Construction of pipeline sections through various water crossings
- Sleeve pipes for the fibre optic cable network
- Construction of a temporary HDPE water reticulation pipeline to residents adjacent to the rising main

- Construction of a new water reticulation with a main diameter of 90 mm to 200mm; and
- Traffic management

2.2 Programme

A first order programme has been compiled addressing timeframes and the proposed order of implementation for the proposed project. Refer to Table 1 for the proposed preliminary implementation programme with the various project deliverables' commencement and completion dates indicated.

Table 1: Proposed preliminary programme for Sub-Phase 1A

Task Name	Start Date	Finish Date
Phase 1A: Pipeline-NEWWTW to Pressure Tank (Bigen)	14-09-16	13-08-19
Additional Services	14-09-16	13-12-19
Professional Services	14-09-16	22-11-21
Design	14-12-19	31-08-20
Documentation and Procurement	01-09-20	23-11-20
Contract Administration & Inspection	24-11-20	25-10-21
Close-out	26-10-21	22-11-21
Construction Monitoring	24-11-20	25-10-21
Construction Works	24-11-20	25-10-21

Based on the above table the commencement date was scheduled for 14 September 2016 with implementation readiness of Sub-Phase 1A estimated to be 31 August 2020.

3. BULK AND LINK SERVICES

The preliminary design proposals and outcomes will be addressed in line with the following identified scope of work:

- +/- 5km pipeline from the NE WWTW to the Break Pressure Tank Inlet
- Construction of the proposed pipeline through various water crossings
- Fibre Optic Communication

3.1. Pipeline

The proposed section of pipeline from the connection point to the watershed and break pressure tank inlet (Section C to D in Map 3) should be designed to deliver 77Mℓ/day. In order to determine the optimum diameter for the pipeline a Life Cycle Cost Analysis (LCCA) was performed for a range of diameters focussing on the section from the connection point (C) to the watershed and break pressure tank inlet (D). A LCCA was performed for the following range of diameters: Ø1m; Ø1.1m; Ø1.2m; and Ø1.3m.

The following assumptions were applied in the execution of the diameter sizing LCCA:

- Consumer Price Index (CPI) at 6%;
- LCCA period of 30 Years;
- Pipeline maintenance taken as 0.5% of capital cost per year;
- Pump station maintenance taken as 6.6% of mechanical/electrical capital cost per year (i.e. pump lifetime of 15 years);
- Pumping time of 20 hours per day;
- Pipeline material is assumed to be Glass Reinforced Pipe (GRP);
- LCCA based on capital cost, Operation and Maintenance (O&M) costs and electricity costs (all Nett Present Value (NPV)).
- The LCCA outcomes for the various specified diameters are indicated in Table 2 below.

Table 2: Life Cycle Cost Analysis Outcomes for Scenario 1:

	Electricity	Construction Cost NPV						Maintenance		Operations		
Pipe Diameter [mm]	Electricity NPV	Connection - Watershed	NE - Connection	Bloemspruit - Connection	North Eastern Pump Station	Additional Construction Cost	Total Construction Cost	Pipeline Maintenance Costs	Pump Station Maintenance Cost	Operational Costs	Water Savings Cost NPV	Total NPV
	i	ii	iii	iv	v	vi	vii	viii	ix	x	xi	xii
1000	77 853 717.18	40 302 628	963 909	56 110 303	6 091 747	4 500 000	107 868 582	14 361 525	12 189 581	7 350 000	5 132 415 600	239 623 409
1100	71 871 501.03	43 923 720	963 909	56 110 303	5 960 428	4 500 000	111 458 355	15 349 690	11 926 799	7 350 000	5 132 415 600	237 756 346
1200	68 834 570.33	48 224 034	963 909	56 110 303	5 834 983	4 500 000	115 683 200	15 704 739	11 775 823	7 350 000	5 132 415 600	239 038 343
1300	66 363 040.86	52 928 819	963 909	56 110 303	5 830 493	4 500 000	120 342 518	16 500 454	11 684 825	7 350 000	5 132 415 600	242 346 838

The method in determining the total Nett Present Value (NPV) for the Life Cycle Cost Analysis (LCCA) over a period of thirty (30) years will be discussed with reference to the various elements' numbering in the above table.

The total electricity cost (i) for each diameter size over a period of thirty (30) years is indicated in the above table. A pump size is determined for the respective diameters based on the amount of energy required for meeting the various duty points. The forecasted pumping time for each year is determined for the following time slots: peak-; standard-; and off-peak times for both winter and summer months. The respective times as determined are further applied to the various time slots' tariffs along with the pump size to determine the total electricity cost (i).

The construction cost for the pipeline from the connection point where the treated effluent gravity line ties into the pump line after the new low lift pump station to the watershed (ii) in the above table is derived based on a unit cost of GRP pipeline per meter length as obtained from the manufacturers for the different pipe diameters. The respective cost for additional couplings for each diameter size is also taken into account. The excavation and associated backfilling costs are calculated based on the various diameter sizes and an assumed unit rate for excavation and backfilling applied in order to determine the total construction cost for the respective diameter sizes. Different valve installations and valve chamber construction costs are also taken into account to determine the total construction cost for the pipeline from the connection point to the break pressure tank (ii).

The construction cost for the pipeline from North Eastern WWTW (iii) to the connection point where the gravity line ties into the pump line is calculated based on the unit cost for the supply and delivery of a 800mm diameter GRP pipe. Other additional costs for specific elements required along the pipeline route including air valves, scour valves, isolating valves, chambers, etc. are also included in the calculation. The construction cost for the pipeline from Bloemspruit WWTW to the connection point (iv) is calculated similarly by applying the unit cost for the supply and delivery of a 800mm diameter GRP pipe to the required pipeline length.

The construction cost for the new low lift pump station (v) is calculated based on a first order estimation including civil and structural costs; pipework and valves; and electrical works including the Motor Control Centre (MCC) and Programmable Logic Controller (PLC). The total estimated construction cost for the pump station (v) also includes a mechanical cost estimation based on a fixed mechanical operation cost per kW for the required pump sizes for the respective diameter sizes.

The additional construction cost (vi) includes a fixed estimated construction cost for the buffer pond and the break pressure tank. The total construction cost (vi) is merely a summation of the cost of laying a pipeline from the connection point to the watershed (ii); the cost of the pipeline from North Eastern WWTW to the connection point (iii); the pipeline from Bloemspruit WWTW to the connection point (iv); the North Eastern WWTW pump station (v); and the additional construction costs (vi).

The total pipeline maintenance costs (viii) is calculated based on the stated assumed pipeline maintenance cost of 0.5% as a percentage of the total capital cost per year. This percentage is applied to the total pipeline capital cost (ii-iv) for a period of thirty (30) years in order to determine a maintenance cost over the total LCCA period for the respective diameter sizes.

The total pump station maintenance costs (ix) is calculated by applying the stated assumed pump station maintenance cost of 6.67% as a percentage of the total capital cost per year to the estimated pump station capital cost (v) for the respective diameter sizes over an LCCA period of thirty (30) years.

The total operational cost (x) for each diameter size is calculated based on an assumed yearly operational cost (NPV) for the following operational elements: a system operator; an operator's vehicle; and an operator's equipment. The total of the assumed yearly operational cost for the above elements is applied to the total LCCA period of thirty (30) years to determine the total pump station operational cost (x) for each diameter size.

The total implementation cost (xii) is determined as a summation of the electricity costs (i); the total construction costs (vii); the pipeline maintenance

costs (viii); the pump station maintenance costs (ix); and the operational costs (x).

From the complete LCCA and Table 2 above it can thus be concluded that the most cost effective option for the Maselspoort Recirculation Pipeline project is for the implementation and installation of a 1.1m diameter pipe for the pipeline section from the connection point to the break pressure tank. The outcome of the LCCA is also graphically presented in Figure 1 below.

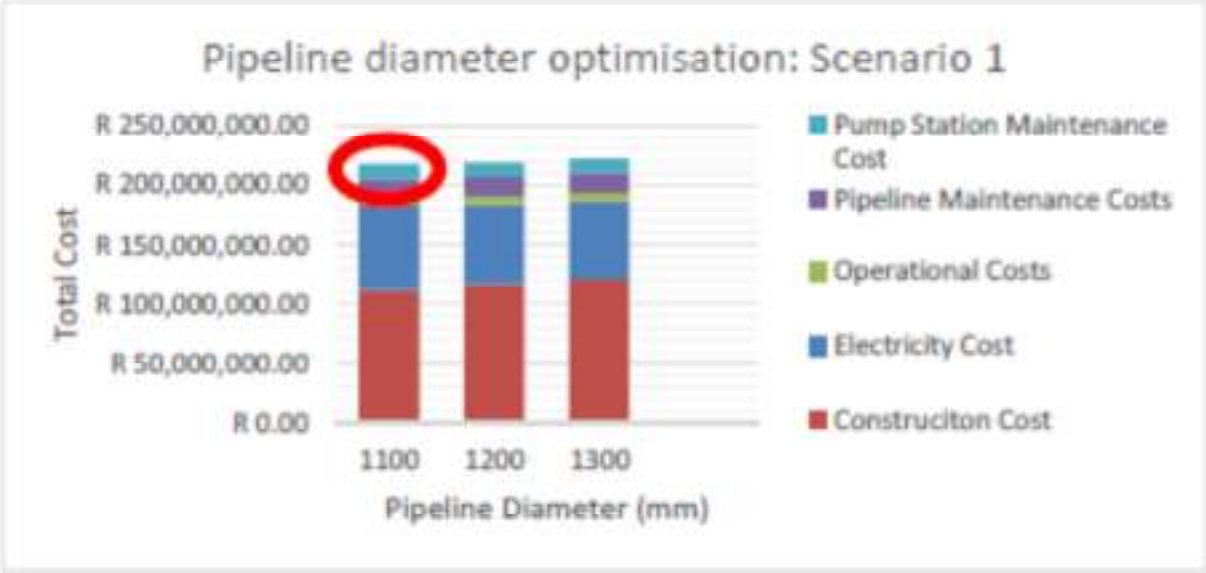


Figure 1: Life Cycle Cost Analysis Outcomes for Scenario 1

The above calculations thus indicate that the installation of a 1.1m Ø pipeline for the section from the connection point at North Eastern WWTW to the break pressure tank is the most cost effective option for the pipeline and, depending on Client approvals, further detail designs will be based on this optimum diameter sizing. The pipeline will also be further optimised during detail design to utilise the existing static head maximally for energy saving related to booster pumping.

Pipeline Material

The client requested that GRP (Glass Reinforced Pipe) technology be use for low pressure and high flow requirements. In order to determine which material will be most effective in the application of the pipeline material a cost comparison between steel and GRP pipes was performed.

As the steel price in South Africa is currently very sensitive to the political and economic environment the steel prices cannot be accurately determined and fixed for the time of tender release. To make a comparison between steel and GRP pipes, quotations were requested for both pipe materials in order to make a cost comparison based purely on material costs. The latest revised quotations for both steel and GRP pipes were requested January 2017.

As for both pipe materials (of the same diameter) the trench preparations-; excavations-; bedding-; backfilling-; and valve costs will be the same. The biggest cost difference can be awarded to the difference in the supply and deliver rate of the different materials. For the GRP pipe it is assumed that additional couplings will be required every 80m across the length of the pipe route. Furthermore, for the installation of GRP pipes no additional installation factors need to be taken into account.

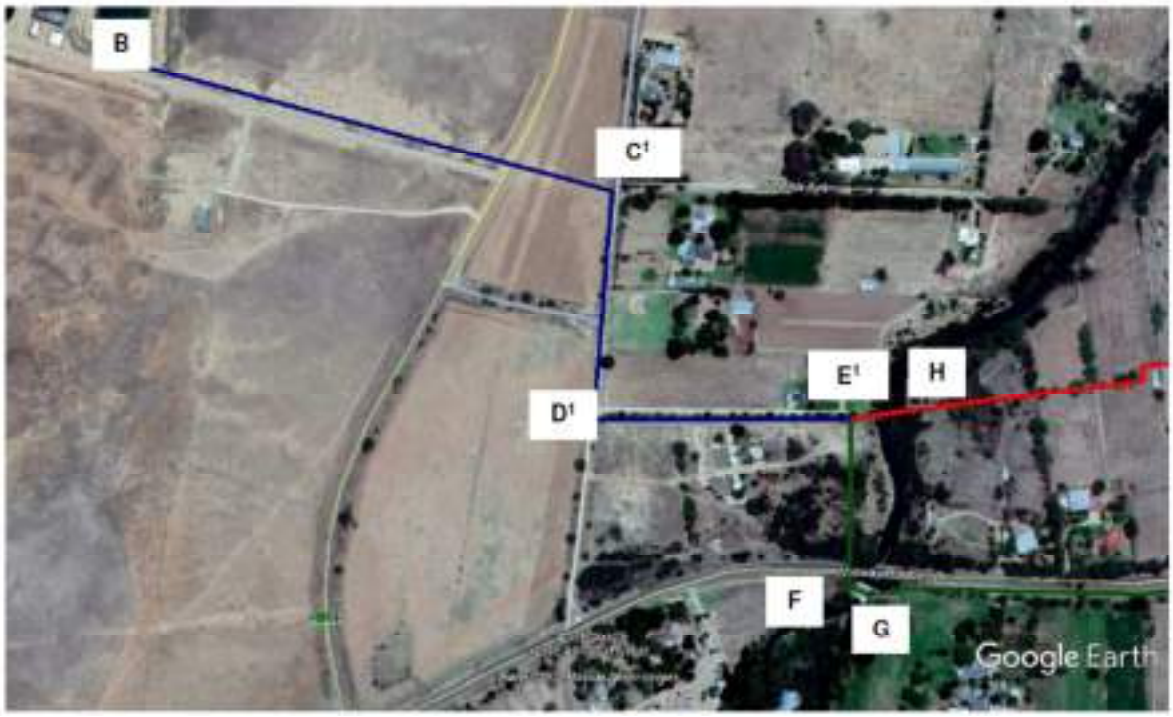
For the installation of a steel pipe various additional factors need to be accounted for including the welding cost to join the 12m pipe lengths. The amount of welds is thus calculated for every 12m across the pipeline route length and an additional 20% welds accounted for additional fittings and/or bends. The welding rate is difficult to predict as this will vary considerably with different contractors.

Cost factors consider with the installation of a steel pipe includes a DCVG (Direct Current Voltage Gradient) survey which will need to be conducted after the installation of the steel pipes. The design, installation and commissioning of a CP and AC mitigation system also needs to be considered with the installation of a steel pipeline. The cost of such a system can vary considerably based on the different grounding techniques required for different unique environments. A conservative cost for both the DCVG survey as well as the CP and AC mitigation system is assumed for the purposes of the cost comparison.

The total installation cost for both pipes are redirected to an installation cost per meter for comparison. It should be noted that this cost per meter only includes the varying elements between the two pipe materials and the actual rate per meter will be considerably higher once excavation-; bedding-; backfilling-; and valve costs are also included. It was thus determined that the installation cost (R/m) for the installation of GRP pipe is the most cost effective option. This outcome is also based on a very conservative welding-; DCVG survey-; and CP and AC mitigation system cost for the installation of a steel pipe and should the actual cost of these elements be higher than predicted, the difference in rates will be even more favourable for the installation of a GRP pipe.

River Crossing

The pipeline will follow optional routes as indicated in the map below (Map 4).



Map 4: Pipeline route: Road and River Crossing

a) As indicated in the above image the pipeline will follow for **route option 1** (this option was already approved as part of the previous application submitted to DESTEA – please confirm) from the North Eastern WWTW (B) to a point where the A40 road needs to be crossed (F) by means of pipe jacking. The designed pipeline from North Eastern WWTW is a GRP pipe of 800mm Ø but for the section of the road crossing the pipe material will be altered to a 800mm Ø steel pipe.

   Immediately after the road crossing the pipeline route will bend in the direction of Maselspoort where the pipeline will need to cross the river (G) where a river crossing structure needs to be designed.

   The proposed river crossing (G) will be designed to include the installation of two (2) 800mm Ø steel pipes. There is an existing water main which currently crosses over the bridge and in order to make the exercise of the river crossing more economically feasible it is proposed that this 200mm Ø steel pipe also be included in the design of the river crossing. Refer to Figure 2 below for a schematic representation of the preliminary design of the river crossing.

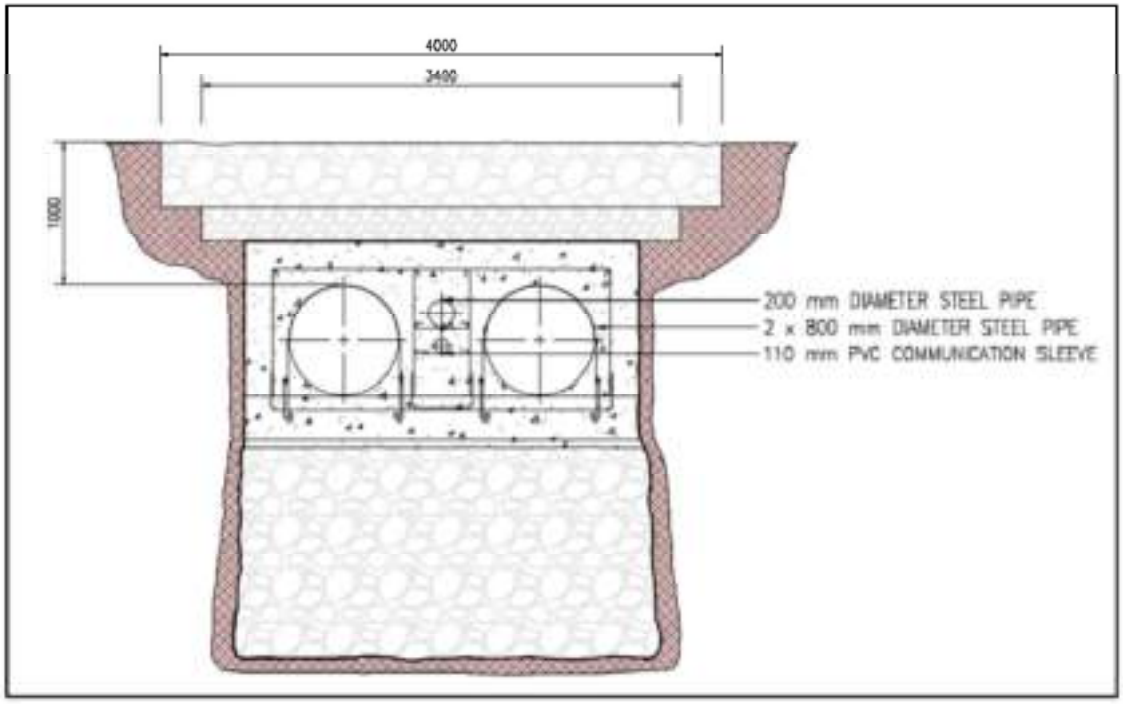


Figure 2: Schematic Preliminary Design of the River Crossing

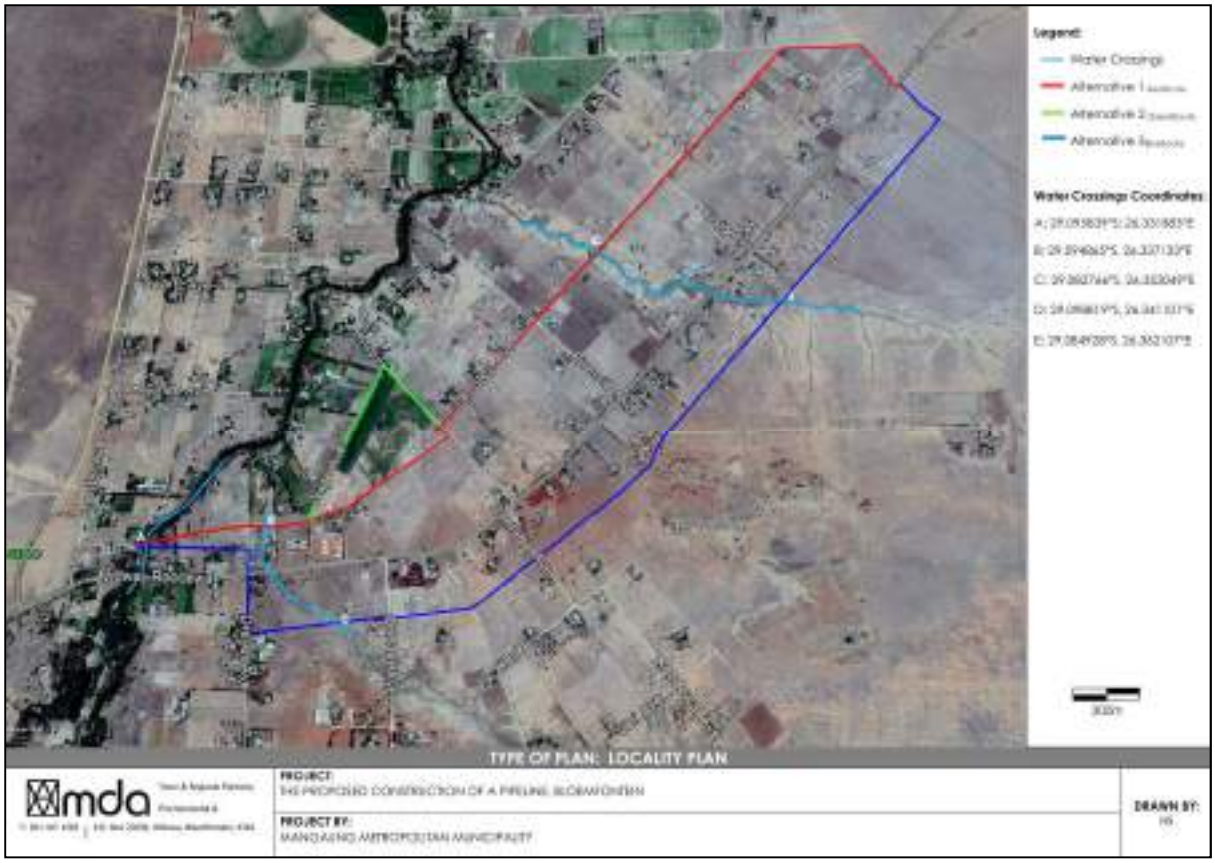
From the image above it can be seen that the two (2) 800mm Ø steel pipes are designed to be placed a distance of 1m below the river bed. The 200mm Ø steel water pipe will run between the two (2) 800mm Ø steel recirculation pipelines. The reason for the installation of two (2) recirculation pipelines is to make provision for future maintenance on the pipeline. It is proposed that the pipes should be concrete encased and will be covered by two (2) rip-rap layers and the entire river crossing structure enclosed by a protective Sealmac Filament Polyester Paving Fabric.

b) For route option 2 from the North Eastern WWTW (B) to a point (E1) where Renosterspruit needs to be crossed by means of river crossing. The designed pipeline from North Eastern WWTW is a GRP pipe of 800mm Ø but for the section of the river crossing the pipe material will be altered to a 800mm Ø steel pipe. This design will be similar to that described in option 1.

c) Pipeline crossing other water crossings

The water crossings associated with the proposed project are indicated in Map 5. Point A is discussed in Section (a) and (b) above. The scope of works associated with Points B, C, D and E are as follows:

A pipeline (glass reinforced pipe) with a diameter of 1.1m will be constructed under the water crossings, by taking the methods as stipulated in SABS 1200 DB 1989 into consideration. A copy of the document is attached hereto.



Map 5: Water crossings associated with the proposed project.

3.3.4 Pipeline Route Specifications

The final optimised and proposed pipeline route for Sub-Phase 1A is summarised in this section.

The pipeline from the NE WWTW (B) to the connection point (C1) (refer to Map 3) should be designed for a capacity of 39Mℓ/day. This section of pipeline has been optimised for a design of 800mm Ø GRP pipe for a length of approximately 1 110m from the NE WWTW to the connection point where the proposed future pipeline from Bloemspruit WWTW will connect to the pipeline.

After this connection point the pipeline should have a capacity of 77Mℓ/day combining the 39Mℓ/day capacity from the NE WWTW and the 38Mℓ/day capacity from Bloemspruit WWTW.

After the connection point the A40 road needs to be crossed by means of pipe jacking. The pipe jacking should be designed for a 800mm Ø steel pipe for a length of approximately 70m. After the river crossing the pipeline material will revert back to GRP pipe but the size should increase to a 1100mm Ø pipe to accommodate the 77Mℓ/day capacity for an approximate length of 4600m up to the point of the designed break pressure tank (D).

3.5 Fibre Optic Communication

Provision need to be made along the entire pipe length for fibre optic communication cable. Sleeves will be installed in the trench excavations above the pipe with access points located at the existing air- and scour valve chambers.

4. NATURAL ENVIRONMENT

4.1 Topography and Surveys

The proposed routes can be classified as average sloped with two high points of which the first one will be the Critical Point determining the hydraulic gradient. For the purpose of the preliminary designs the LIDAR survey completed by MMM was utilised.

4.2 Geological and Geotechnical Aspects

A geotechnical investigation for the holistic project and Maselspoort Recirculation Pipeline in its totality has been completed by the consulting engineering firm, SMEC. The report thus also addressed the geotechnical aspects for the current project.

Preliminary slope stability calculations have also been performed yielding a stability safety factor greater than 1 which is acceptable for the purposes of the pipeline trench excavations.

The slope stability calculations will be addressed in more detail during the detail design phase.

4.3 Environmental and Cultural/Historical Issues

A Basic assessment Report will be compiled by MDA Consultants.

4.4 Surface and Subsurface Rights

Farmers and consumers downstream of the proposed catchment point for the pipeline have allocated water rights based on the natural run-off of Bloemspruit and Renosterspruit as listed with the Department of Water and Sanitation (DWS). The additional run-off produced by the WWTWs is for this reason not allocated to the water users and is available for re-use by the Municipality.

At present obtaining approval from all land owners for the construction of this pipeline over their properties proof to be difficult with a reluctance of owners to complete required approval forms. Though the general response is that owners are not against the implementation of this reuse pipeline, the acceptance of such development on their property seems to be of a concern.

5 CONTRACT STRUCTURE

5.1 Overall Contract Structure

The General Conditions of Contract applicable to this Contract shall be the Conditions of Contract for Plant and Design – Build, for Electrical and Mechanical Plant, and for Buildings and General Engineering Works, Designed by the Contractor: FIDIC (Yellow Book) First Edition, 1999.

5.2 Construction Methods

Open trench excavation methods will be used for the construction of the pipeline. All road crossings to be completed by pipe jacking. The size of the pipe will require the use of side booms in order to ensure pipes do not get damaged. This equipment will require 20m wide construction servitude. Service owners such as the Department of Police Roads and Transport need to be consulted in order to determine minimum requirements for services constructed within the servitude of the service owners.

5.3 Sub-Contracting

Sub-Contractors will be utilised for the pipe jacking and other specialist services. Depending on the skill and resources of the appointed Contractors the mechanical and electrical works at the pump station will also be Sub-Contracted.

5.4 Procurement

MMM Supply Chain Management Policy (SCMP) will be applied in the procurement of a civil Contractor according to the CIDB (Construction Industry Development Board) guidelines for a Contractor with a CIDB grading of 8CE or higher through an open public tender process.

6 CONCLUSION AND RECOMMENDATIONS

The scope of the larger project includes the design and construction for the transfer of treated effluent from the North Eastern (NE) WWTW and Bloemspruit WWTW to Mocke's Dam. The proposed section of pipeline associated with the current project will connect to sections of pipeline of with the EA was already obtained. Three alternative routes are currently investigated in order to connect the already approved pipeline with the newly proposed pipeline (current project).

The newly proposed pipeline alternatives are indicated in Map 1.

Recommendations:

6.1 Scope of Works

The scope of works for the current project include the construction of a treated effluent water pipeline from the Connection Point (C) to the

watershed and break pressure tank inlet (D) as indicated in the map below, in order to transport 77Mℓ/day.

6.2 Land Owner Consent

Alternative survey methods may not require owner consent to complete topographical surveys for detail design purposes. However owner consent will be required to construct the pipeline and register a servitude in the name of the Municipality. It's recommended that these matters be resolved closer to the time of tender. Should mutual agreement fail to be reached, the alternative would be expropriation.

6.3 Environmental Authorisation and Water Use Licence.

An Environmental Authorisation was issued for the original pipeline route adjacent to the A40 road between Bloemfontein and Mocke's Dam. This authorisation has been extended till 2022/09/06.

3.6 MATERIALS FOR REINSTATEMENT OF ROADS AND PAVED AREAS

3.6.1 Subbase and Base. Where trenches cross or run along surfaced roads and paved areas of which the surfaces are scheduled to be reinstated, the Contractor shall obtain prior approval of subbase and base materials that may be required to supplement such materials lost during excavation.

3.6.2 Gravel. Where trenches cross or run along gravel roads of which the surfaces are scheduled to be reinstated, the Contractor shall, for the purpose of reinstatement, separately stock the top 300 mm of material excavated.

3.6.3 Bituminous Construction. Materials for bituminous construction shall comply with the applicable requirements of the appropriate of the following specifications:

Primer	SABS 749 or SABS 769
Cutback bitumens or emulsions	SABS 308 or SABS 309
Coarse aggregate (stone chips)	SABS 1083

3.6.4 Asphalt Carpet. An asphalt carpet shall consist of either of the following mixes:

a) 6,7 mm coarse aggregate (stone chips) ..... 100 parts by mass, plus
MC 250 cutback bitumen ..... 7 parts by mass of emulsion
or
b) 6,7 mm coarse aggregate (stone chips) ..... 100 parts by mass, plus
premix Grade 80 bitumen emulsion ..... 8 parts by mass of emulsion

4.3 SELECTION. The Contractor, in addition to complying with 5.6, shall not wastefully dispose of excavated material that complies with 3.3 and 3.4.

The Contractor is not required to use selective methods of excavating but may, if he so wishes, screen, wash or otherwise treat excavated material in order to produce material suitable for the bedding. He shall take positive steps to avoid burying or contaminating materials which otherwise would be suitable for use as:

a) selected fill for the blanket or selected granular material for the cradle, unless other materials have been specified, or

b) topsoil, or

c) road materials for re-use in terms of 5.9.

When otherwise suitable material from a trench is contaminated, the Contractor shall, to make up any shortfall, obtain (at his own expense if the contamination is due to his methods of working) suitable material from other excavations on the site, or by opening up borrow pits, or by importing from commercial or other sources.

Subject to the requirements of 3.5, hard rock and boulders from excavations that conform to the classification given in Subclauses 3.1.2(e)-(e) (inclusive) of SABS 1200 D or Subclauses 3.1.2(c)-(e) (inclusive) of SABS 1200 DA, as applicable, shall be incorporated in the backfill. The Engineer may direct that the material be suitably mixed with other backfill material.

4. PLANT

4.1 EXCAVATION EQUIPMENT. The Contractor may use trenching plant that will excavate to a width such that the side allowance does not exceed the appropriate value specified in 5.2 by more than 50 %, except that where, in terms of the project specification or of the drawings, the base width of a trench for a pipeline or a portion of a pipeline is not to exceed the minimum base width or a stated value, the Contractor shall use trenching plant that will produce the required trench width or he shall accept responsibility for all costs incurred in strengthening the relevant pipelines.

4.2 CONTROL OF WATER. The Contractor shall use appropriate techniques or provide plant such as pumps, well points and sheeting or close timbering for keeping the trenches sufficiently free from water to enable him to lay pipes true to line and level and to bed them soundly, all as specified in this specification (see 5.1.2).

4.3 COMPACTION EQUIPMENT. The Contractor may use mechanical compaction equipment but he shall select such equipment and operate it in such a manner that the pipeline, duct or cable is not strained or damaged.

Machine compaction shall not be used directly above the pipe until sufficient backfill has been placed to ensure that machine compaction loads transmitted to the top of the pipe are no greater than would be imposed by normal road traffic over a pipeline with cover of depth 600 mm.

5. CONSTRUCTION

5.1 PRECAUTIONS

5.1.1 General. The requirements of Subclauses 5.1 of SABS 1200 D or Subclause 5.1 of SABS 1200 DA, as applicable, shall apply in addition to the requirements of 5.1.2 below.

5.1.2 Stormwater, Seepage and Dewatering of Excavations

5.1.2.1 Throughout the Works. In dealing with water as required in terms of Subclause 5.5 of SABS 1200 A or Subclause 5.9 of SABS 1200 AA, as applicable, and Subclause 5.1.1 of SABS 1200 D or Subclause 5.1.4 of SABS 1200 DA, as applicable, the Contractor shall, subject only to such particular items as are scheduled for designated hazards in terms of 5.1.2.2, properly and adequately protect the Works from flooding and damage by stormwater, flow from springs, and seepage.

5.1.2.2 Special Water Hazards. The Engineer may schedule particular items for dealing with a special water hazard at a designated point or in a designated part of the Works and as required in terms of the project specification (see 8.3.2 and 8.3.4(b)).

5.1.2.3 Sloping ground. In the case of a trench on sloping ground, the Contractor shall take approved measures (such as the construction of cross-embankments) to minimize erosion in the trench and adjacent ground from which vegetation has been removed.

5.1.3 Accommodation of Traffic and Access to Properties. Where the work affects the operation or safety of public traffic,

a) in addition to complying with the relevant requirements of Subclause 5.1.6 of SABS 1200 D or Subclause 5.1.8 of SABS 1200 DA, as applicable, the Contractor shall

i) construct or put in order such bypass(es) as may be required to deviate traffic from portions of the road that are to be affected by the construction; or

ii) where half-width construction is ordered or approved (as in the case of most direct crossings of roads), so arrange his work that the traffic will at all times have free one-lane access to at least half the width of the roadway;

b) wherever possible, where half-width construction is used, ensure that the whole road is open at night and, at the end of each day's work, is left in a good and safe trafficable condition, complete with the traffic signs and the protection facilities specified in Subclause 5.1.6 of SABS 1200 D or Subclause 5.1.8 of SABS 1200 DA, as applicable;

a) ensure that the useable width of road is,
i) for two-way traffic, at least 6 m, and
ii) for single-lane traffic, at least 4 m for each lane; and
b) the Contractor shall provide and allow reasonable access to persons occupying properties that fall within or adjoin the area over which he is working. If, for any reason, such access has to be closed for any period(s) during the construction period, the persons affected shall be given reasonable notice, in writing, of each such period of closing.

5.1.4 Existing Services that Intersect or Adjoin Trenches. The requirements of Subclause 5.3.2 of SABS 1200 D or Subclause 5.3.7 of SABS 1200 DA, as applicable, shall apply.

5.2 MINIMUM BASE WIDTHS. Unless otherwise specified (see 4.1) in the project specification or on the drawings or elsewhere in the specifications, the base width of a trench (see Drawing DB-4) shall be not less than the external diameter of the pipe barrel plus twice the side allowance determined from the following table:

External diameter of pipe barrel, mm		Side allowance on each side, mm
Over	Up to and including	
-	125	300 (See (b) below)
125	700	300
700	1 000	400
1 000	2 000	500
2 000	-	600

a) Where two or more pipes are to be placed in one trench, the base width of the trench shall be not less than the sum of the external diameters of the pipe barrels plus the side allowance for each outer pipe plus, between each pair of adjacent pipes, the average of the side allowance for each pipe.
b) The minimum base width for pipes of external diameter not exceeding 125 mm and laid at a depth not exceeding 1,5 m may be less than 600 mm for flexible continuous piping that, in terms of the drawings, project specification or schedule, requires no bedding or jointing in the trench.

5.3 SITE CLEARANCE. The Contractor shall clear (as specified in SABS 1200 C) an area of sufficient width along the route of the pipeline to ensure that his excavation operations are not hampered (see 3.7).
Where trenches are in servitudes or wayleaves of specified width, the Contractor shall ensure that clearing and damage to plant growth is restricted to the servitude or wayleave area.

5.4 EXCAVATION. Pipe trenches shall be excavated in lengths approved by the Engineer, to widths that, in each case, provide at least the appropriate side allowance (within trench supports and walls, if any) given in 5.2, and such that half of the base width is on either side of the designated centre-line of the pipe. The sides of each trench from the bottom up shall be as nearly vertical as possible for at least the height of the bedding. (See also the requirements relating to the stockpiling of excavated material given in 3.7 and those relating to excavated material given in Subclause 5.3.4.3 of SABS 1200 D or in Subclause 5.3.6 of SABS 1200 DA, as applicable.)

5.5 TRENCH BOTTOM. Material that the Engineer considers to be unsuitable at the bottom of the trench shall be excavated to the depths and disposed of in the manner directed. The resulting space shall be refilled, as ordered, with approved material and compacted as directed.
Should bedding of the pipeline in accordance with SABS 1200 LB form part of the contract, the depth of the trench shall be such that the specified depth of the cradle can be placed under the pipeline, and the trimming and grading of the bottom of the trench shall be such that the barrel of each length of pipe can be uniformly supported over its full length, free at the joints, and at the correct grades and levels. Except where the trench excavation is in rock, hard objects and boulders that may adversely affect the uniformity of the foundation shall be removed to a depth of 100 mm below the specified trench bottom. Where the bottom of the trench has been loosened during excavation, it shall be compacted at OMC to 90 % of modified AASHTO maximum density prior to bedding and pipelaying.
The bottom of trenches shall be sufficiently straight (or true to alignment in the case of curved pipelines) to enable the pipes to be laid without reduction of the side allowances given in 5.2 and in conformity with the applicable tolerances specified in any standardized specification covering pipework that forms part of the contract.

5.6 BACKFILLING

5.6.1 General. Backfilling of pipe trenches shall commence after the pipe has been laid and firmly bedded in the specified cradle and the blanket has been placed and adequately compacted at OMC around, under the overhang and over the top of the pipe to the height of blanket cover specified elsewhere in the contract (see Drawing DB-11.
Backfilling shall be carried out in accordance with 5.6.2 over the full extent of the actual trench excavation and to original ground level, except where otherwise directed. Unless prior approval has been obtained, no filling shall be placed in water. (See also 5.1.2.)

5.6.2 Material for Backfilling. Unless the Contractor is authorized by the Engineer to use other material (see 5.6.5), material for backfilling above the bedding (cradle and blanket) shall be obtained from trench excavations.
Hard and rock material shall be incorporated in the backfill above the bedding only to the extent approved. Depending on the quality of the material, the Engineer may direct that it be suitably mixed with other backfill material.
In areas subject to road traffic loads and where the available backfill has a PI higher than 12, the Contractor shall obtain specific instructions from the Engineer before proceeding with the placing of the backfill.

5.6.3 Disposal of Soft Excavation Material. Excavation material from the trench, which is unsuitable or has become surplus because of bulking, displacement by the pipe and importation, shall be disposed of along the trench servitude within the freehaul distance from the source of such excavation material, unless otherwise required in terms of the project specification.

APPENDIX E

Public Participation

APPENDIX E_1

List of identified possible interested and affected parties

The proposed construction of a pipeline, Maselspoort	
Table 2: List of identified possible interested and / or affected parties: Authorities & Stakeholders	
Organization	**Contact person and contact detail**
The Municipal Ward Councillor: Ward 47	Ward Councillor, Ward 47 7 Barnes Street Westdene Bloemfontein 9301 Mokgadi Kganakga mokgadikganakga99@gmail.com 083 886 9494
The Municipal Ward Councillor: Ward 44	Selmé Pretorius 7 Barnes Street Westdene Bloemfontein 9301 082 824 2047 selpret@gmail.com
The Municipal Ward Councillor: Ward 17	Thomas Ferreira 7 Barnes Street Westdene Bloemfontein 9301 082 631 3898 Thomas.crusaders@gmail.com
Mangaung Metro Municipality City Manager	The City Manager P.O. Box 3704 Bloemfontein 9300
Mangaung Metro Municipality: Enviornmental Division	Me. Mpolokeng Kolobe P.O. Box 3704 Bloemfontein 9300
Mangaung Metro Municipality: Planning Division	Collin Dihemo P.O. Box 3704 Bloemfontein 9300
Department of Agriculture	The Assistant Director P.O. Box 34521 Faunasig Bloemfontein 9325
SAHRA	South African Heritage Resources Agency (SAHRA) 111 Harrington Street CAPE TOWN 8001

The proposed construction of a pipeline, Maselspoort	
Table 2: List of identified possible interested and / or affected parties: Authorities & Stakeholders	
Organization	**Contact person and contact detail**
FSHRA	Ntando PZ Mbatha Heritage Coordinator Corner Henry and East Burger Street Department of Sport Arts Culture and Recreation Office 204 Bloemfontein 9301
Department of Water and Sanitation	Mr. W Grobler Private Bag X528 Bloemfontein 9300
Department of Police, Roads and Transport	Mr H Maree P.O. Box 119 Bloemfontein 9300

TABLE 3: PROPERTY DESCRIPTION AND LAND USE ZONING OF PROPERTIES ASSOCIATED WITH THE PROPOSED PIPELINE CONSTRUCTION ACTIVITIES, AS WELL AS PROPERTIES ADJACENT		
PROPERTY DESCRIPTION	**SG NUMBER**	**MANNER OF NOTIFICATION**
REMAINDER OF THE FARM ROODEWAL 2942	F00300000000294200000	REGISTERED POST & E-MAIL KOPANO NOKENG /14 MIDWAY /ROODEWAL / BLOEMFONTEIN /9326
RIVERSIDE SMALL HOLDINGS RE/6	F00300690000000600000	PAMPHLET DISTRIBUTION PROCESS
RIVERSIDE SMALL HOLDINGS RE/7	F00300690000000700000	REGISTERED POST WILHELMINA FREDRIKA KRUGER 73 LA PROVANCE WEG / BETHLEHEM / 9700 / C: 0837081540 / DRE.KRUGER@SPAR.CO.ZA
RIVERSIDE SMALL HOLDINGS 1/7	F00300690000000700001	PAMPHLET DISTRIBUTION PROCESS
RIVERSIDE SMALL HOLDINGS RE/8	F00300690000000800000	PAMPHLET DISTRIBUTION PROCESS
ROODEWAL SMALL HOLDINGS RE/13	F00300740000001300000	PAMPHLET DISTRIBUTION PROCESS / REGISTERED POST H E VENTER 13 WILGE AVENUE / RODEWAL / BLOEMFONTEIN / 9301 T: 0532059200 / C: 0834403493 / BETSIE@SHISAS.COM
ROODEWAL SMALL HOLDINGS RE/25	F00300740000002500000	PAMPHLET DISTRIBUTION PROCESS
ROODEWAL SMALL HOLDINGS RE/26	F00300740000002600000	PAMPHLET DISTRIBUTION PROCESS
ROODEWAL SMALL HOLDINGS RE/27	F00300740000002700000	PAMPHLET DISTRIBUTION PROCESS
ROODEWAL SMALL HOLDINGS RE/40	F00300740000004000000	PAMPHLET DISTRIBUTION PROCESS
ROODEWAL SMALL HOLDINGS RE/41	F00300740000004100000	PAMPHLET DISTRIBUTION PROCESS
ROODEWAL SMALL HOLDINGS	F00300740000004200000	PAMPHLET DISTRIBUTION PROCESS

TABLE 3: PROPERTY DESCRIPTION AND LAND USE ZONING OF PROPERTIES ASSOCIATED WITH THE PROPOSED PIPELINE CONSTRUCTION ACTIVITIES, AS WELL AS PROPERTIES ADJACENT		
PROPERTY DESCRIPTION	**SG NUMBER**	**MANNER OF NOTIFICATION**
RE/42		
ROODEWAL SMALL HOLDINGS RE/54	F00300740000005400000	PAMPHLET DISTRIBUTION PROCESS
ROODEWAL SMALL HOLDINGS RE/55	F00300740000005500000	PAMPHLET DISTRIBUTION PROCESS
ROODEWAL SMALL HOLDINGS RE/56	F00300740000005600000	PAMPHLET DISTRIBUTION PROCESS
ROODEWAL SMALL HOLDINGS RE/63	F00300740000006300000	REGISTERED POST MOLLER PIETER WILLEM 17 ROSENHEIM / BESEMBOSSTRAAT / BLOEMFONTEIN / 9301 / T: 0514211135 / C: 0829226694
ROODEWAL SMALL HOLDINGS RE/64	F00300740000006400000	PAMPHLET DISTRIBUTION PROCESS
ROODEWAL SMALL HOLDINGS RE/65	F00300740000006500000	PAMPHLET DISTRIBUTION PROCESS
ROODEWAL SMALL HOLDINGS RE/66	F00300740000006600000	PAMPHLET DISTRIBUTION PROCESS
ROODEWAL SMALL HOLDINGS RE/67	F00300740000006700000	PAMPHLET DISTRIBUTION PROCESS
ROODEWAL SMALL HOLDINGS RE/68	F00300740000006800000	PAMPHLET DISTRIBUTION PROCESS
ROODEWAL SMALL HOLDINGS RE/69	F00300740000006900000	PAMPHLET DISTRIBUTION PROCESS
ROODEWAL SMALL HOLDINGS RE/70	F00300740000007000000	PAMPHLET DISTRIBUTION PROCESS

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PROPERTY DESCRIPTION	**SG NUMBER**	**MANNER OF NOTIFICATION**
ROODEWAL SMALL HOLDINGS 1/70	F00300740000007000001	PAMPHLET DISTRIBUTION PROCESS
ROODEWAL SMALL HOLDINGS 2/70	F00300740000007000002	PAMPHLET DISTRIBUTION PROCESS
ROODEWAL SMALL HOLDINGS 3/70	F00300740000007000003	PAMPHLET DISTRIBUTION PROCESS
ROODEWAL SMALL HOLDINGS RE/71	F00300740000007100000	PAMPHLET DISTRIBUTION PROCESS
ROODEWAL SMALL HOLDINGS 1/71	F00300740000007100001	PAMPHLET DISTRIBUTION PROCESS
ROODEWAL SMALL HOLDINGS 2/71	F00300740000007100002	PAMPHLET DISTRIBUTION PROCESS
ROODEWAL SMALL HOLDINGS 3/71	F00300740000007100003	PAMPHLET DISTRIBUTION PROCESS
ROODEWAL SMALL HOLDINGS RE/72	F00300740000007200000	PAMPHLET DISTRIBUTION PROCESS
ROODEWAL SMALL HOLDINGS RE/73	F00300740000007300000	PAMPHLET DISTRIBUTION PROCESS
ROODEWAL SMALL HOLDINGS RE/74	F00300740000007400000	PAMPHLET DISTRIBUTION PROCESS
ROODEWAL SMALL HOLDINGS RE/75	F00300740000007500000	PAMPHLET DISTRIBUTION PROCESS
ROODEWAL SMALL HOLDINGS RE/76	F00300740000007600000	PAMPHLET DISTRIBUTION PROCESS
ROODEWAL SMALL HOLDINGS RE/77	F00300740000007700000	PAMPHLET DISTRIBUTION PROCESS
ROODEWAL SMALL HOLDINGS RE/78	F00300740000007800000	PAMPHLET DISTRIBUTION PROCESS
ROODEWAL SMALL HOLDINGS RE/79	F00300740000007900000	PAMPHLET DISTRIBUTION PROCESS
ROODEWAL SMALL HOLDINGS	F00300740000008000000	PAMPHLET DISTRIBUTION PROCESS

TABLE 3: PROPERTY DESCRIPTION AND LAND USE ZONING OF PROPERTIES ASSOCIATED WITH THE PROPOSED PIPELINE CONSTRUCTION ACTIVITIES, AS WELL AS PROPERTIES ADJACENT		
PROPERTY DESCRIPTION	**SG NUMBER**	**MANNER OF NOTIFICATION**
RE/80		
ROODEWAL SMALL HOLDINGS RE/81	F00300740000008100000	PAMPHLET DISTRIBUTION PROCESS
ROODEWAL SMALL HOLDINGS RE/82	F00300740000008200000	PAMPHLET DISTRIBUTION PROCESS
ROODEWAL SMALL HOLDINGS RE/83	F00300740000008300000	PAMPHLET DISTRIBUTION PROCESS
ROODEWAL SMALL HOLDINGS RE/84	F00300740000008400000	PAMPHLET DISTRIBUTION PROCESS
ROODEWAL SMALL HOLDINGS 1/84	F00300740000008400001	PAMPHLET DISTRIBUTION PROCESS
ROODEWAL SMALL HOLDINGS 2/84	F00300740000008400002	PAMPHLET DISTRIBUTION PROCESS
ROODEWAL SMALL HOLDINGS 3/84	F00300740000008400003	PAMPHLET DISTRIBUTION PROCESS
ROODEWAL SMALL HOLDINGS RE/85	F00300740000008500000	PAMPHLET DISTRIBUTION PROCESS
ROODEWAL SMALL HOLDINGS 1/85	F00300740000008500001	PAMPHLET DISTRIBUTION PROCESS
ROODEWAL SMALL HOLDINGS RE/86	F00300740000008600000	PAMPHLET DISTRIBUTION PROCESS
ROODEWAL SMALL HOLDINGS RE/87	F00300740000008700000	PAMPHLET DISTRIBUTION PROCESS
ROODEWAL SMALL HOLDINGS RE/88	F00300740000008800000	PAMPHLET DISTRIBUTION PROCESS
ROODEWAL SMALL HOLDINGS RE/89	F00300740000008900000	PAMPHLET DISTRIBUTION PROCESS
ROODEWAL SMALL HOLDINGS RE/90	F00300740000009000000	PAMPHLET DISTRIBUTION PROCESS

TABLE 3: PROPERTY DESCRIPTION AND LAND USE ZONING OF PROPERTIES ASSOCIATED WITH THE PROPOSED PIPELINE CONSTRUCTION ACTIVITIES, AS WELL AS PROPERTIES ADJACENT		
PROPERTY DESCRIPTION	**SG NUMBER**	**MANNER OF NOTIFICATION**
ROODEWAL SMALL HOLDINGS RE/106	F00300740000010600000	PAMPHLET DISTRIBUTION PROCESS
ROODEWAL SMALL HOLDINGS 1/106	F00300740000010600001	PAMPHLET DISTRIBUTION PROCESS
ROODEWAL SMALL HOLDINGS RE/107	F00300740000010700000	PAMPHLET DISTRIBUTION PROCESS
ROODEWAL SMALL HOLDINGS RE/108	F00300740000010800000	PAMPHLET DISTRIBUTION PROCESS
ROODEWAL SMALL HOLDINGS RE/109	F00300740000010900000	PAMPHLET DISTRIBUTION PROCESS
ROODEWAL SMALL HOLDINGS RE/110	F00300740000011000000	PAMPHLET DISTRIBUTION PROCESS
ROODEWAL SMALL HOLDINGS 1/110	F00300740000011000001	PAMPHLET DISTRIBUTION PROCESS
ROODEWAL SMALL HOLDINGS 2/110	F00300740000011000002	PAMPHLET DISTRIBUTION PROCESS
ROODEWAL SMALL HOLDINGS 3/110	F00300740000011000003	PAMPHLET DISTRIBUTION PROCESS
ROODEWAL SMALL HOLDINGS RE/111	F00300740000011100000	PAMPHLET DISTRIBUTION PROCESS
ROODEWAL SMALL HOLDINGS RE/112	F00300740000011200000	PAMPHLET DISTRIBUTION PROCESS
ROODEWAL SMALL HOLDINGS RE/166	F00300740000016600000	PAMPHLET DISTRIBUTION PROCESS
ROODEWAL SMALL HOLDINGS	F00300740000016600001	REGISTERED POST & E-MAIL

TABLE 3: PROPERTY DESCRIPTION AND LAND USE ZONING OF PROPERTIES ASSOCIATED WITH THE PROPOSED PIPELINE CONSTRUCTION ACTIVITIES, AS WELL AS PROPERTIES ADJACENT		
PROPERTY DESCRIPTION	**SG NUMBER**	**MANNER OF NOTIFICATION**
1/166		MARGUERITE CRONJE / P.O. BOX 29729 / DANHOF / 9310 / C: 082 702 0547
ROODEWAL SMALL HOLDINGS 2/166	F00300740000016600002	PAMPHLET DISTRIBUTION PROCESS
ROODEWAL SMALL HOLDINGS RE/167	F00300740000016700000	PAMPHLET DISTRIBUTION PROCESS
ROODEWAL SMALL HOLDINGS RE/175	F00300740000017500000	PAMPHLET DISTRIBUTION PROCESS
ROODEWAL SMALL HOLDINGS 1/175	F00300740000017500001	PAMPHLET DISTRIBUTION PROCESS
ROODEWAL SMALL HOLDINGS 2/175	F00300740000017500002	PAMPHLET DISTRIBUTION PROCESS
ROODEWAL SMALL HOLDINGS 3/175	F00300740000017500003	PAMPHLET DISTRIBUTION PROCESS
ROODEWAL SMALL HOLDINGS 4/175	F00300740000017500004	PAMPHLET DISTRIBUTION PROCESS
ROODEWAL SMALL HOLDINGS 5/175	F00300740000017500005	ACCORDING TO THE DEED'S OFFICE, THE HOLDING AREA OR HOLDING NUMBER OR HOLDING PORTION DOES NOT EXIST

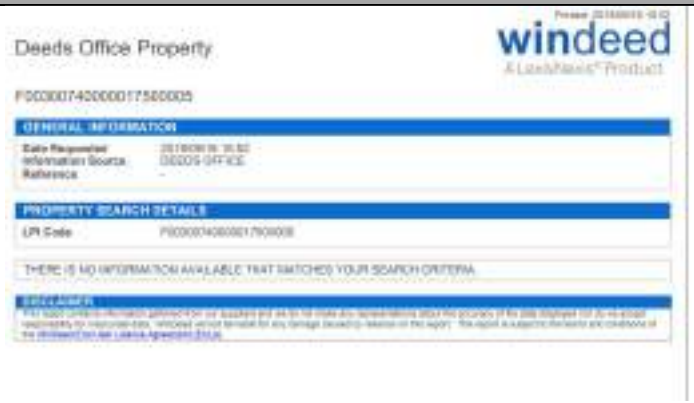
TABLE 3: PROPERTY DESCRIPTION AND LAND USE ZONING OF PROPERTIES ASSOCIATED WITH THE PROPOSED PIPELINE CONSTRUCTION ACTIVITIES, AS WELL AS PROPERTIES ADJACENT		
PROPERTY DESCRIPTION	**SG NUMBER**	**MANNER OF NOTIFICATION**
		
ROODEWAL SMALL HOLDINGS 5/176	F00300740000017600005	PAMPHLET DISTRIBUTION PROCESS
ROODEWAL SMALL HOLDINGS 6/176	F00300740000017600006	REGISTERED POST & E-MAIL BATAUNG FAMILY TRUST BATAUNG FAMILY TRUST / MR N MALEFANE / PO BOX 23538 / KAGISANONG / 9323 / NEO@LEANOSOLUTIONS.CO.ZA / T: 0514417221 / C: 0722506211 / C: 0824240875 / F: 0865182028
ROODEWAL SMALL HOLDINGS 7/176	F00300740000017600007	PAMPHLET DISTRIBUTION PROCESS
REMAINDER OF THE FARM MAZELSPOORT 8	F00300000000000800004	REGISTERED POST & E-MAIL ALETTA JOHANNA DOMAN MR VAN RENSBURG / ON BEHALF OF MS ALETTA DOMAN / VAN RENSBURG ADVISORY SERVICES / 34 HIPPOCRENE STREET / BLOEMFONTEIN / 9301 / / MS ALETTA DOMAN / P.O. BOX 120909 / BRANDHOF / 9324

TABLE 3: PROPERTY DESCRIPTION AND LAND USE ZONING OF PROPERTIES ASSOCIATED WITH THE PROPOSED PIPELINE CONSTRUCTION ACTIVITIES, AS WELL AS PROPERTIES ADJACENT		
PROPERTY DESCRIPTION	**SG NUMBER**	**MANNER OF NOTIFICATION**
		ALETTADOMAN@GMAIL.COM / T: 051 441 7942
REMAINDER OF THE FARM ZUURFONTEIN 2022	F00300000000202200001	REGISTERED POST ZUURFONTEIN PROPERTIES ZUURFONTEIN PROPERTIES / ABSA BUILDING / 3RD FLOOR / 14 STRAND STREET / BELVILLE / CAPE TOWN / C: 0828204627 / T: 0127554040 / 0219153172
REMAINDER OF THE FARM ROODEWAL 2943	F00300000000294300000	REGISTERED POST & E-MAIL KOPANO NOKENG KOPANO NOKENG /14 MIDWAY /ROODEWAL / BLOEMFONTEIN /9326
REMAINDER OF THE FARM ROODEWAL 292	F00300000000029200000	REGISTERED POST & E-MAIL GUSTAV BUYS GUSTAV BUYS / P.O. BOX 4079 / BLOEMFONTEIN / 9301 / C: 082 773 6785

APPENDIX E_2

Proof of notification

Site Notices:

Advert:

www.volksblad.com

OM TE ADVERTEER SKAKEL BFN: T: 051 404 7757 · F: 051 447 2940 KBY: T: 053 831 2331 · F: 053 831 2330 · E: adverts@volksblad.com / Anthea.arends@volksblad.com (Kimberley)

Geklassifiseerd

STERFGEVALLE

STEYN

† 06/03/1941 - 24/06/2019

Die troosdiens van Petronella Staffelina, in lewe van Bloemfontein, vind plaas vanuit Rosenhein Aftree Oord op Woensdag, 10 Julie 2019 om 14:00. Die verassing vind privaat plaas.

BLOEMFONTEIN, 051 447 1011
SAMBA kontrakteur vir uitvoering van begrafnisse
AVBOB We're here for you

POTGIETER

18/01/1952 - 24/06/2019

Die troosdiens van Hendrik George (Bok), 67 jaar, in lewe van Bloemfontein, vind plaas vanuit die NG Kerk Pellissier, Vlakfonteinlaan op Dinsdag 2 Julie 2019 om 11:00. Die verassing vind privaat plaas.

Reëlings: Tel: 051 448 8566
SAMBA kontrakteurs vir die uitvoering van begrafnisse
Emmanuel

GREYSON JEWEL

Passed away peacefully on 21/06/2019

Deeply mourned by her family

The memorial service of Jewel formally of Serenitas, Bloemfontein will take place on Wednesday 10 July 2019 at 10h00 at the Andrew Murray Community Church, 34 Alexander Avenue, Arboretum, Bloemfontein. By request no flowers or donations.

ALGEMENE KENNISGEWINGS

GEMEENSKAPS-KENNISGEWINGS 1210

The following vehicle will be sold by public auction to recover debt owing. The vehicle will be sold to recoup outstanding debt, 30 (thirty) days after publication. The vehicle is an **ISUZU 2.4** with registration number **DXD 131 FS**, to be sold to recover outstanding debt.
DCW ATTORNEYS
Danial Wessels
4 Brill Street
Westdene
Bloemfontein
(051) 447 0805
dan@dcwlaw.co.za

PERSOONLIKE DIENSTE

LENINGS 1445

BRIDGING CASH while waiting for **PENSION/PACKAGE/ PROPERTY SALE.** Payout (lump sum only). 086 110 1388/ 076 886 7655.

TE KOOP

ALLERLEI 1655

DESLEY
KOOP EN VERKOOP
BENODIG DRINGEND
Tweedehandse en Antieke Huishoudelike Meubels
INRUILINGS WELKOM
Skakel vir GRATIS Tuiskwotasies
051 444 1638
Victoriaweg 66 Willows
www.desley.co.za

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

GESLAGDE SKAAP C GRAAD R54.90 PER KG. LAM R74.90 PER KG. SKAKEL LOUISE ☎ 071 603 2877 BFN.

Kom besoek ons gerus van die 20ste tot die 30ste Junie vir die beste waarde vir geld-winskope **Cash Converters 051 430 5468**

WILD KARKASSE . SPRINGBOK, BLESBOK, ROOIBOK. SKAKEL LOUISE ☎ 071 603 2877 BFN.

ALGEMENE & HUISDIENSTE

BOUWERK & KONSTRUKSIE 1801

ALGEMENE NUTSMAN: Staalwerk, herseël van dakke, krane, verf. Skakel 083 707 7967.

BLITZ BETON: Vir betonheinings, randstene en vervang van bestaande betonheinings. **Skakel 051 433 1077/ 082 441 7413.**

BOU 104 VKM BAKSTEENHUISE met teëldak teen R299 000. Doen ook alle aanbouings en skermmure. ☎ **082 625 6613.**

ELEKTRIES 1810

1-CALL Appliance Repairs: Alle wasmasjiene, tuimeldroërs, ys-/vrieskaste. Oop Ma. - Sa. Herstel binne 24 uur by u huis! ☎ **073 363 9075. Hoewes en Plase**

HERSTELWERK 1818

HERSTEL van yskaste by u huis, asook gas. Soek dringend yskaste, werkend of nie. Gratis kwotasie. **MSE. 082 573 4737.**

TE HUUR 1820

SALE te huur op skouterrein vir troues, funksies en spesiale skoue. Persele ook beskikbaar op langtermynbasis. Skakel **Juanita by 051 448 9894/5/6.** www.bloemshowgrounds.co.za

YSKASTE/VRIESKASTE: Te huur en herstelwerk aan huishoudelike toerusting. **Bloemfontein Fridge Hire 051 522 4616/ 082 485 6940.**

LOODGIETERS 1855

Oranje Loodgieters: Algemene loodgieterswerk en verstopte rioolpype. **076 493 5503.**

VERVOER & BERGING 1870

Algemene Vervoer Verwydering van tuinafval en bourommel asook ry van trekke (ook platteland). Eenmalige skoonmaak van erf en sypaadjies. **Skakel 071 301 3016**

ARCHIE'S MEUBELVERVOER Landwyd ook. Jare se ondervinding en versekering. **Sel. 083 282 8052**

LE ROUX KOTZE: MEUBELVERVOER EN VERHUISING. ☎078 304 9372.

SAKKIE ☎ 082 879 8280. VERWYDER ROMMEL EN TREKKE.

BOME 1871

AAA Tree-Felling: 40% afslag. ☎**Joubert 083 240 7905.**

AFSAAG van bome: Gratis kwotasie. Annemie 083 480 7999.

LANDBOU

BOORGATE 2202

BOOR EN SKOONMAAK van watergate: Bloemrock Drilling. Hennie 082 780 9063/ Isak 072 189 6034

BOOR, skoonmaak en toets van gate. Installeer pompe. 35 jaar in die bedryf. Skakel Dawie Coetzee 083 368 3725/Jacques Coetzee 083 486 9539.

PRODUKTE 2225

Integri Feeds. geregistreede voere. Wildspille en Ram,lam en ooi : R175/50KG Droogte: R160/50KG Suiwel 19% (ureum vry) R165/40KG Blokke en vele ander pille vir diere. **Skakel 072 9289 635 Bloemfontein**

* Lusern: R80
* Hawer: R75
* Mielies R150 vir 50
* Straight Run
* Gemaalde Lusern

Skakel Francois 083 468 9746

SAKE

TE KOOP 2405

Partytjie winkel met unieke voorraad en gevestigde kliente . Uitstekend geleë. Groot potensiaal en plesier om te bestuur. Goeie inkomste. Prys R880 000. **Skakel Pieter 082 483 2953 NRE.**

SAKE GELEENTHEDE 2415

Kan jy belê in beesboerdery? Sal jy weidings-praktyk kan ontwikkel en op die plaas wil woon? ☎ **Gert 082 802 2464.**

VAKANSIE & REIS

AKKOMMODASIE 2635

JEFFREYSBAAI: PINNAQUIN-4-STER-vakansie-eenhede met seeuitsig, vir 5 persone. 5 min. se stap na strand, winkels en restaurante. Pensioenarisafslag. 0422961111/0828234662/ Johan 082 552 3642. Pinnaquin@pinnaquin.co.za www.pinnaquin.co.za **4-STER-gastehuis:** 0422960008/0827751568.

VOERTUIE

BAKKIES/4X2's TE KOOP/HUUR 3010

Bakkie Sentrum
soek dringend bakkies en dubbelkajuite om te koop.
082 339 9071
051 448 5740
bakkiesentrum@vodamail.co.za
BESOEK GERUS ONS WEBTUISTE BY:
www.bakkiesentrum.co.za

MOTORS TE KOOP 3025

2005 Chevrolet Spark LS. Baie goeie algemene en meganiese kondisie. 87 900km. R37 000 ohb. ☎ **John 078 998 0184**

VOERTUIE GESOEK OM TE KOOP 3075

Soek voertuie vir kontant. Skakel 051 447 2399 of 084 208 2565.

EIENDOMME

DUETS TE KOOP 3240

LHP - R 1 795 000 Moderne 3 slpk duet met dubbelgeriewe Oopplan leefareas. Skou Sondag: 15h00 – 17h00 **AnnaMarie 083 981 4089**

PLASE TE KOOP 3245

Wesselsbron: 252ha Netjiese saaiplaas, 75ha besproeiing (2 x 5 toring), 120ha droëland, 57ha weiding, geen huis of verbeterings. **Louis 061 304 3249 louis@farmexpert.co.za**

WOONSTELLE TE HUUR 3250

1 Man woonstel – Onmiddellik beskikbaar. Ten volle toegerus en gemeubileerd, DStv. Onderdak parkering. Pellissier. R4 400 + R400 krag. Deposito betaalbaar. **Andre - 083 6547361**

TUINWOONSTELLE TE HUUR 3265

1 Bedroom Garden Cottage to rent in North Cottage in Helicon Heights with a private garden, covered parking and own entrance. Large lounge with kitchenette, neat bathroom and lots of cupboards throughout. Kitchen has built-in stove, recently painted. Pets Welcome Available 1 Aug 2019. R3 900 excl elec. **Contact Diana 082 8077 678**

HUISE TE KOOP 3275

Noordhoek: Dringende verkoop. 3 Slk huis , plus woonstel, swembad **R699 000 GEEN AGENTE Skakel 079 7732 069**

KAMERS TE HUUR 3315

Langenhovenpark. 1 Kamer R3 250 p.m. W en L ingesluit **Skakel 082 298 1053**

MEENTHUISE TE KOOP 3330

LHP - R 795 000 2 Slpk eenheid in gewilde kompleks. Koopkrag. Swembad in kompleks. ☎ **Annamarie 083 981 4089.**

MEENTHUISE TE HUUR 3335

Pentagonpark
• **Eenhede:** R9 200 p.m. 3 Slk met dubbel geriewe Meenthuis in kompleks met swembad, baie veilig.
• **Luukse** Meenthuis met beste uitkyk en alles wat u benodig R10 200 p.m.
Skakel 082 807 2534.

BETREKKINGS 3600

ALGEMEEN 3680

Finansiële bestuurder B Com (Accounting) met 5 jaar ondervinding. **Stuur asb u CV en finansiële verwagting na js@propertycommerce.co.za**

Gevestigde Makelaar benodig 'n **korttermyn eise persoon** (Junior pos). Eise ondervinding is 'n vereiste. **Stuur CV na heckmar@heckmar.co.za** Sluitingsdatum 5 Julie 2019

ONTVANGS/ADMIN KLERK
Gevestigde mediese spesialis praktyk in Bloemfontein benodig 'n dinamiese hardwerkende persoon as Ontvangsdame met 'n positiewe gesindheid.
Die suksesvolle kandidaat moet aan die volgende vereistes voldoen:
* Ten volle tweetalig wees en oor 'n Graad 12 kwalifikasie / Sekretariële Diploma beskik;
* Rekenaargeletterd wees en goed en akkuraat kan tik.
* 5+ Jaar toepaslike ondervinding in 'n mediese praktyk (Ontvangs);
* Goed met invorderings en admin.
* Goeie skakeling met pasiënte en mediese fondse;
* 25+ jaar oud wees.

Vyfdag werksweek. Salaris onderhandelbaar rondom R14 000.00 (veertienduisend) p.m. ander voordele.
Indien jy aan bogenoemde vereistes voldoen, stuur jou CV na **hannatjie@effectivepers.co.za.**
Indien jy nie binne 14 dae terugvoer kry nie, beskou jou aansoek as onsuksesvol.

SCHOEMANPARK Gholf-klub is opsoek na 'n voltydse dame met rekeningkundige agtergrond **Stuur CV na: finance.schoemanpark@gmail.com**

Transformer Sales Consultant / Sales Manager
A sales person with transformer/electrical knowledge required. In-house training will be given. 4-5 Years' experience in sales and tender processes will be beneficial. Must have a proven track record of exceptional client service, must be computer literate, willing to travel. **E-mail CV to jobs@fstx.co.za**

VERSORGER VIR OU DAME OP 'N PLAAS IN RICHMOND, NK. VERGOEDING TUSSEN R6 500 PM. ETES EN VERBLYF INGESLUIT. **STUUR CV NA locummed@gmail.com of skakel RETHA 083 445 4214**

REGSKENNISGEWINGS & TENDERS

HOFBEVELE/ SEKWESTRASIES/ LIKWIDASIES 4005

NOTICE

MAREE & VENNOTE PROKUREURS/ ATTORNEYS

IN THE HIGH COURT OF SOUTH AFRICA
FREE STATE DIVISION, BLOEMFONTEIN
Case No: 821/2019
Before the Honourable Justice JP Daffue
On the 30th day of May 2019
In the matter between:
STANDARD BANK OF SOUTH AFRICA LIMITED
Applicant
and
OLIVERS RUST LANDGOED (PTY) LIMITED
Respondent
Having considered the documents filed in this matter and having heard argument
IT IS ORDERED THAT:
1. The Respondent Company is hereby placed under Provisional Winding-up in the hands of the Master of the Hight Court.
2. SA Provisional Order is hereby issued calling upon all interested parties to show cause, if any, to the Court on the 11th day of July 2019 at 09:30 why a Final Order of Winding-up should not be granted against Respondent Company.
3. Service of this rule, and a copy of the Notice of Motion and annexures must be effected on the Respondent Company at its registered Office, or its principal place of business within the court's jurisdiction.
4. This order must, without delay, be published in Die Volksblad and The Government Gazette.
5. A copy of the winding-up order must be served on -
5.1 Every registered trade union that as far as the Sheriff can reasonably ascertain, represents any of the employees of the Respondent Company.
5.2 The employees of the Respondent Company by affixing a copy of the application and provisional order on any notice board to which the employees have access inside the Respondent Company's premises or if there is no access to the premises by the employees, by affixing a copy to the front gate or front door of the premises from which the Respondent Company conducted any business.
5.3 The South African Revenue Services.
6. The sheriff must ascertain whether the employees of the respondent are represented by a Trade Union and whether there is a notice board on the premises to which the employees have access.
BY ORDER OF THIS COURT
COURT REGISTRAR
MAREE & PARTNERS

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

OIS OMGEWINGSIMPAKSTUDIE 4045

Notice is given in terms of

(a) Regulation 41(2)(a) of the Environmental Impact Assessment Regulations of 2014, No. 326 published in Government Notice No. 40772 (as amended 2017) under the National Environmental Management Act, 1998 (Act No. 107 of 1998) that applications for environmental authorization will be submitted to the Free State Department of Economic Development, Small Businesses, Tourism and Environmental Affairs (DESTEA)

(b) Regulation 17(3)(a) of the Regulations Regarding The Procedural Requirements for Water Use License Applications and Appeals of 2017 No. R. 267 published in Government Notice No. 40713 of 24 March 2017 under the National Water Act (Act 36 of 1998) Section 21 as amended, that applications for a Water Use License will be submitted to the Department of Water and Sanitation (DWS) (if required)

for the following projects:

(a) Proposed construction of a pipeline to transfer treated water from the existing waste water treatment plants to Mockes dam.
Proponent: Mangaung Metropolitan Municipality.
Locality: From the WWTW at Liquinda (Bloemfontein), towards Mockes Dam.

(b) The proposed construction of a diesel depot on Portion 1 of Plot 42, Estoire, Bloemfontein.
Proponent: Mack's Petroleum (PTY) LTD.

For more information or to register as an interested and / or affected party, submit your name, contact information and interest / comments regarding the environmental impact of the proposed projects to **MDA (hanlie@mdagroup.co.za 051 447 1583 / P.O. Box 100982 Brandhof Bloemfontein, 9324) within 30 days of this notification.**

VERKOOP VAN SAAK 4055

Kennisgewing van verkoping van besigheid:
Kennis word hiermee gegee in terme van Artikel 34(1) van die Insolvensiewet Nr. 24 van 1936, soos gewysig, aan alle belanghebbendes en krediteure van Sandstone Tiles BK h/a Mugg & Bean Northridge Mall, registrasienommer 2008/123749/23 (die "verkoper") dat die Beslote Korporasie voornemens is om die besigheid, klandisiewaarde en bates van die besigheid bekend as Mugg & Bean Northridge Mall, geleë te Winkel 3, Northridge Mall, Kenneth Kaundaweg, Helicon Heights, Bloemfontein, tesame met alle huurkontrakte as 'n lopende saak, te verkoop aan 'n nuwe eienaar, welke koper die besigheid sal voortsit vir eie rekening en voordeel.
Prokureurs namens die Verkoper:
Harm Schreurs, MSDP Maritz, Schreurs and Du Preez Attorneys, 128 Monument Road, Kemptonpark, Johannesburg, 1620.
Kontaknr. 011 972 1360

Notice of sale of business:
Notice is hereby given in terms of Section 34(1) of the Insolvency Act, No. 24 of 1936, as amended, to all interested parties and creditors of Sandstone Tiles CC t/a Mugg & Bean Northridge Mall, registration number 2008/123749/23 (the "seller") that it intends to sell its business, goodwill and assets forming part of its business known as Mugg & Bean Northridge Mall, situated at Shop 3, Northridge Mall, Kenneth Kaunda Road, Helicon Heights, Bloemfontein, together with its assets forming part of the said property and inclusive of all lease agreements, as a going concern to the new owner, which will carry on the business for its own account and benefit.
Attorneys for the seller:
Harm Schreurs
MSDP Maritz
Schreurs and Du Preez Attorneys
128 Monument Road
Kempton Park
Johannesburg, 1620
Tel 011 972 1360

BOEDELKENNISGEWINGS

BOEDELS: KREDITEURE EN DEBITEURE 4201

Standard
This estate is being administered by Standard Trust Limited

AM PIETERSE
In the estate of the late ALETTA MARIA PIETERSE, ID No. 420528 0068 08 2, date of birth 28 May 1942, date of death 26 February 2018, of 11 Jan Kemp Crescent, General De Wet, Bloemfontein.
No. 003067/2018.
The First and Final Liquidation and Distribution Account in the above estate will lie for inspection at the office of the Master of the High Court, Bloemfontein and at the office of the Magistrate, for a period of three weeks from the date of publication hereof.
Standard Trust Ltd
Ref: MS
Private Bag X11
Suite No 22
Brandhof
9324

FNB

AP TOLKEN
Estate of the Late ADRIAAN PIETER TOLKEN, who died on 27 February 2019, Identity Number 590424 5042 08 8, of 5 Langeberg Avenue, Carters Glen, Kimberley, 8301.
ESTATE NO: 001485/2019.
Creditors in the above Estate are hereby called upon to file their claims with, and to pay their debts, to the undersigned within thirty (30) days from date of publication hereof.
FNB Fiduciary (Pty) Ltd
P.O Box 12619
Brandhof
9324
Vinette Kock
+27 87 343 1814

WAARSKUWING

Lesers moet hulle vergewis van alle dienste wat in advertensies aangebied word en kwotasies en deposito's wat vereis word nagaan voordat hulle enigiets aanvaar. Dit is die verbruiker se verantwoordelikheid om die adverteerder met wie hulle sake wil doen, se getuigskrifte na te gaan.

Volksblad Geklassifiseerd bied 'n diens aan adverteerders deur hulle dienste en/of produkte te bemark, maar aanvaar
egter geen verantwoordelikheid of aanspreeklikheid vir enige skade of eise van lesers teen die adverteerder nie.

Notification to Landowner and Adjacent Landowners:

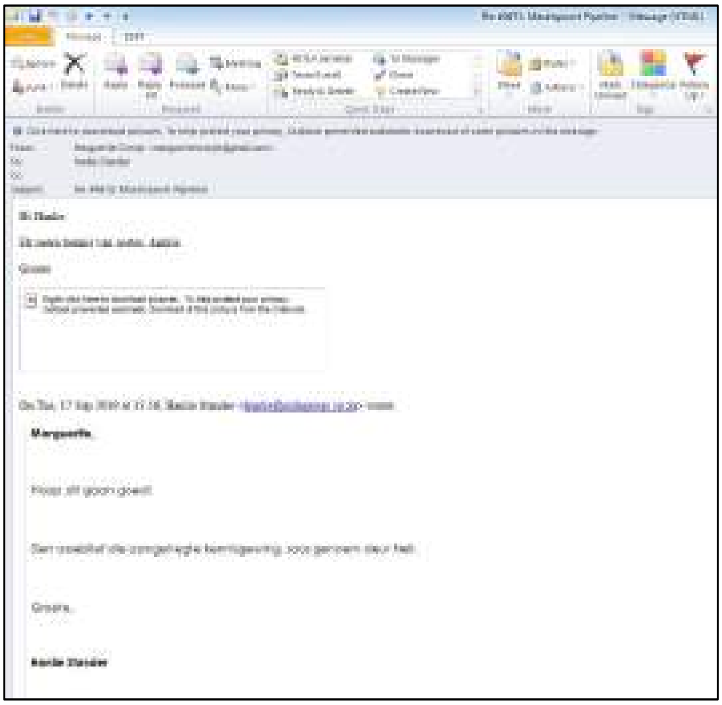
A Pamphlet Distribution Process was undertaken on the 6th and 10th of September 2019.

Property owners not notified by means of the above mentioned process were notified by means of e-mail / registered mail. Please see proof thereof attached hereto.

Your message

To: events@kopanonokeng.co.za
Subject: 40673: Maselspoort Pipeline
Sent: 18/09/2019 07:47 AM

was read on 18/09/2019 08:04 AM.

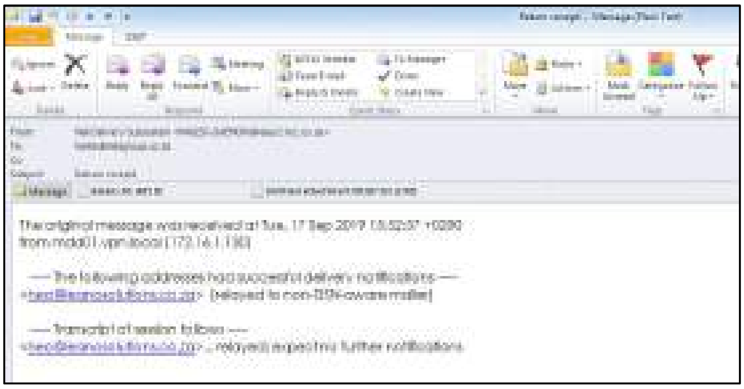


Marguerite,

Hoop dit gaan goed!

Gen voorstel die aangehegte kennisgewing, soos genoem deur hel.

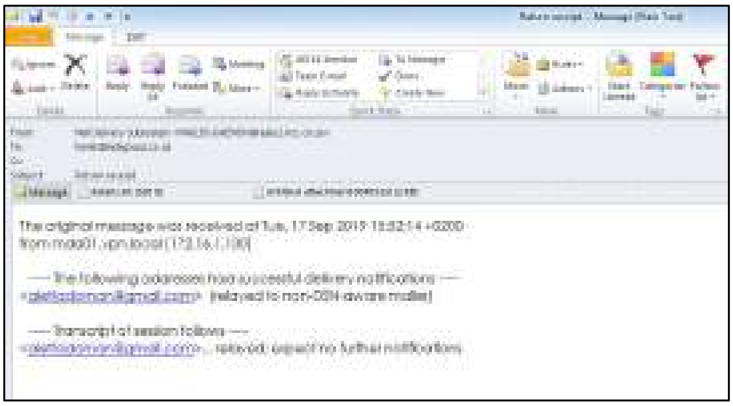
Groete,

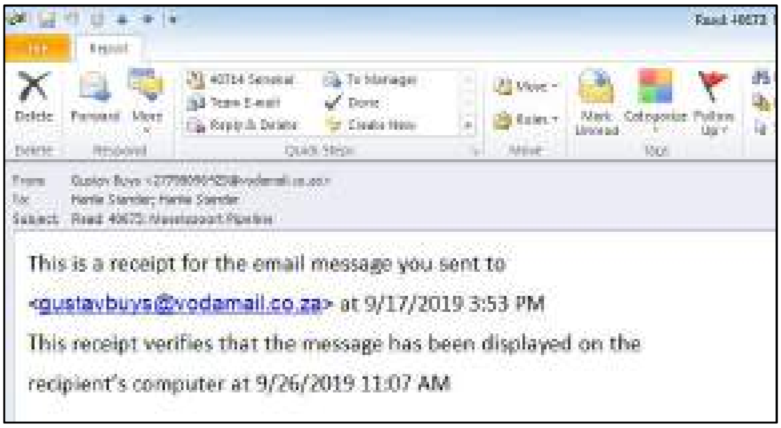


The original message was received at Tue, 17 Sep 2019 15:52:07 +0200
from mdd01.vpn.local [172.16.1.130]

----- The following addresses had successful delivery notifications -----
<henk@eranosolutions.co.za> (relayed to non-DSN-aware mailer)

----- Transcript of session follows -----
<henk@eranosolutions.co.za>... relayed; expect no further notifications


The original message was received at Tue, 17 Sep 2019 15:52:14 +0200
----- The following addresses had successful delivery notifications -----
----- Transcript of session follows -----


From: Gustav Buys
To: Hante Stander; Hante Stander
Subject: Read: 40673 Mazelspoort Pipeline
This is a receipt for the email message you sent to
<gustavbuys@vodamail.co.za> at 9/17/2019 3:53 PM
This receipt verifies that the message has been displayed on the
recipient's computer at 9/26/2019 11:07 AM

Proof of postage
Initial Notification: 40673
mda Maselspoort Pipeline

REMAINDER OF THE FARM ROODEWAL 2942 & REMAINDER OF THE FARM ROODEWAL 2943	KOPANO NOKENG 14 MIDWAY ROODEWAL BLOEMFONTEIN 9326	ORDINARY PARCEL PE 985 070 868 ZA CUSTOMER COPY
RIVERSIDE SMALL HOLDINGS RE/7	73 LA PROVANCE WEG BETHLEHEM 9700	ORDINARY PARCEL CUSTOMER COPY
ROODEWAL SMALL HOLDINGS RE/13	13 WILGE AVENUE RODEWAL BLOEMFONTEIN 9301	ORDINARY PARCEL PE 985 070 190 ZA CUSTOMER COPY
ROODEWAL SMALL HOLDINGS RE/63	17 ROSENHEIM BESEMBOSSTRAAT BLOEMFONTEIN 9301	ORDINARY PARCEL PE 985 070 842 ZA CUSTOMER COPY
ROODEWAL SMALL HOLDINGS 1/166	MARGUERITE CRONJE P.O. BOX 29729 DANHOF 9310	ORDINARY PARCEL CUSTOMER COPY
ROODEWAL SMALL HOLDINGS 6/176	BATAUNG FAMILY TRUST MR N MALEFANE PO BOX 23538 KAGISANONG 9323	ORDINARY PARCEL S.A POST OFFICE 2019 -09- 17 No.: 2 BRANDHOF - 9321
REMAINDER OF THE FARM MAZELSPOORT 8	ALETTA JOHANNA DOMAN MR VAN RENSBURG ON BEHALF OF MS ALETTA DOMAN VAN RENSBURG ADVISORY SERVICES 34 HIPPOCRENE STREET BLOEMFONTEIN 9301	ORDINARY PARCEL CUSTOMER COPY

Proof of postage
Initial Notification: 40673
Maselspoort Pipeline

REMAINDER OF THE FARM ZUURFONTEIN 2022	ZUURFONTEIN PROPERTIES ABSA BUILDING 3RD FLOOR 14 STRAND STREET BELVILLE CAPE TOWN 7535	
REMAINDER OF THE FARM ROODEWAL 292	GUSTAV BUYS P.O. BOX 4079 BLOEMFONTEIN 9301	

APPENDIX E_3

List of registered parties

The proposed construction of a pipeline, Maselspoort		
Table 4: List of registered parties		
Authorities & Stakeholders		
Organization	**Contact person and contact detail**	**Comments and Response**
The Municipal Ward Councillor: Ward 47	Mokgadi Kganakga 7 Barnes Street Westdene Bloemfontein 9301 Mokgadi Kganakga mokgadikganakga99@gmail.com 083 886 9494	**Comment:** None to date **Response:** Copies of the dBAR & fBAR was forwarded to all registered IAPs.
The Municipal Ward Councillor: Ward 44	Selmé Pretorius 7 Barnes Street Westdene Bloemfontein 9301 082 824 2047 selpret@gmail.com	**Comment:** None to date **Response:** Copies of the dBAR & fBAR was forwarded to all registered IAPs
The Municipal Ward Councillor: Ward 17	Thomas Ferreira 7 Barnes Street Westdene Bloemfontein 9301 082 631 3898 Thomas.crusaders@gmail.com	**Comment:** None to date **Response:** Copies of the dBAR & fBAR was forwarded to all registered IAPs
Mangaung Metro Municipality City Manager	The City Manager Mangaung Metro Municipality P.O. Box 3704 Bloemfontein 9300	**Comment:** None to date **Response:** Copies of the dBAR & fBAR was forwarded to all registered IAPs
Mangaung Metro Municipality: Enviornmental Division	Me. Mpolokeng Kolobe Mangaung Metro Municipality P.O. Box 3704 Bloemfontein 9300	**Comment:** None to date **Response:** Copies of the dBAR & fBAR was forwarded to all registered IAPs
Mangaung Metro Municipality: Planning Division	Mr. Collin Dihemo Mangaung Metro Municipality P.O. Box 3704 Bloemfontein	**Comment:** None to date **Response:** Copies of the dBAR & fBAR was forwarded to all registered IAPs

The proposed construction of a pipeline, Maselspoort		
Table 4: List of registered parties		
	9300	
Department of Agriculture	The Assistant Director Department of Agriculture P.O. Box 34521 Faunasig Bloemfontein 9325	**Comment:** None to date **Response:** Copies of the dBAR & fBAR was forwarded to all registered IAPs
FSHRA	Ntando PZ Mbatha Heritage Coordinator Corner Henry and East Burger Street Department of Sport Arts Culture and Recreation Office 204 Bloemfontein 9301	**Comment:** None to date **Response:** Copies of the dBAR & fBAR was forwarded to all registered IAPs
SAHRA	South African Heritage Resources Agency (SAHRA) Head Office 111 Harrington Street CAPE TOWN 8001	**Comment:** 1. In the event of excavations that exceed 1m depth, the newly uncovered sedimentary strata must be monitored by professional palaeontologist during the excavation phase. 2. Should any objects of archaeological or palaeontological remains be found during construction activities, work must immediately stop in that area and the Environmental Control Officer (ECO) must be informed. 3. The ECO must inform the South African Heritage Recourse Agency (SAHRA) and contact an archaeologist and/or palaeontologist, depending on the nature of the find, to assess the importance and rescue them if necessary (with the relevant SAHRA permit). No work may be resumed in this area without the permission from the ECO and SAHRA. 4. If the newly discovered heritage

The proposed construction of a pipeline, Maselspoort		
Table 4: List of registered parties		
		resource is considered significant a Phase 2 assessment may be required. A permit from the responsible heritage authority will be needed. 5. A Chance Finds Procedures must be developed for the project to ensure that standard protocols and steps are followed should any heritage and/or fossil resources be uncovered during all phases of the project. These procedures should outline the steps and reporting structure to be followed in the instance that heritage resources are found. This must be included in the Environmental Awareness Plan. 6. The final BAR and appendices must be submitted to SAHRA upon submission to DEA. Should the project be granted Environmental Authorisation, SAHRA must be notified and all relevant documents submitted to the case file. **Response:** Noted. Copies of the dBAR & fBAR was forwarded to all registered IAPs
Department of Water and Sanitation	Mr. W Grobler Private Bag X528 Bloemfontein 9300	**Comment:** None to date **Response:** Copies of the dBAR & fBAR was forwarded to all registered IAPs
Department of Police, Roads and Transport	Mr H Maree P.O. Box 119 Bloemfontein 9300	**Comment:** None to date **Response:** Copies of the dBAR & fBAR was forwarded to all registered IAPs
DESTEA	Ms N Molokwane molokwanen@destea.gov.za	**Comment:** Requested clarity on the following: • Detailed project description specific to the proposed project • Start, middle and end point of the proposed pipelines • Size and length of the pipelines

The proposed construction of a pipeline, Maselspoort		
Table 4: List of registered parties		
		• Alternative copy of the newspaper advertisement **Response:** • Detailed project description is included in the current report • The start, middle and end point of the proposed pipelines was provided to DESTEA • The size and length of the pipelines was provided to DESTEA • An alternative copy of the newspaper advertisement was provided to DESTEA. • Copies of the dBAR & fBAR was forwarded to all registered IAPs
Landowners and / or Adjacent Landowners		
Contact Person	**Contact Detail**	**Comments and Response**
Mr Lappies Labuschagne, on behalf of Emain Fourie (Remainder of Small Holdings 66, Roodewal)	051 436 7921 082 900 6881 info@bloemplan.co.za	**Comment:** Requested additional information on the layout of the proposed pipeline. Mr Labuschagne's client (Emain Fourie) wishes to register as an IAP for the proposed project. **Response:** Additional information, with a GoogleEarth Marker was forwarded to Mr Labuschagne. Copies of the dBAR w& fBAR was forwarded to all registered IAPs
Marguerite Cronje	margueritecronje@gmail.com 0827020547	**Comment:** Take note of proposed route. Telephonically confirmed that there is no need to forward the BAR documents, should no amendments be made to the proposed route (not registered as an IAP). **Response:** Copies of the dBAR & fBAR was forwarded to all registered IAPs

APPENDIX E4

List of comments received

Mr Labuschagne contacted MDA on 5th of August 2019, requesting additional information on the layout alternatives of the proposed pipeline.

Hanlie

Ja, hulle wil graag registreer.

Dit is Plot 66 Roodewal Kleinplase.

Plot behoort aan Me. Emain Fourie.

LABUSCHAGNE
LAND SURVEYOR | LANDMETER INC/INGELYF
Reg. No. 2016/381429/21

Lappies Labuschagne
Professional Land Surveyor
Tel: 051 436 7921
Cell: 082 900 6881
Fax: 086 540 5484

From: Hanlie Stander [mailto:hanlie@mdagroup.co.za]
Sent: 02 October, 2019 09:58
To: 'Lappies Labuschagne'
Subject: 40673: Maselspoort Pipeline

Mnr Labuschagne,

Sal u asseblief vir u kliënt vra om te bevestig of hy / sy vir die projek wil registreer / al dan nie.

Indien wel, stuur asseblief u kliënt se kontakbesonderhede aan MDA.

Groete,

Hanlie Stander

Environmental Assessment Practitioner for MDA

mda Town & Regional Planners, Environmental & Development Consultants

Hanlie Stander

From: Lappies Labuschagne <info@bloemplan.co.za>
Sent: 18 September 2019 11:17 AM
To: 'Hanlie Stander'
Subject: RE: 40673: Maselspoort Pipeline

Hanlie

Dankie vir jou terugvoering.

Ek glo dit sal die vrese van my klient besweer.

LABUSCHAGNE
LAND SURVEYOR | LANDMETER INC/INGELYF
Reg. No. 2016/381429/21

Lappies Labuschagne
Professional Land Surveyor
Tel: 051 436 7921
Cell: 082 900 6881
Fax: 086 540 5484

From: Hanlie Stander [mailto:hanlie@mdegroup.co.za]
Sent: 18 September, 2019 08:44
To: 'Lappies Labuschagne'
Subject: 40673: Maselspoort Pipeline

Mnr Labuschagne,

Die voorgestelde roete wat met blou aangedui is, is binne die grense van die Restant van die Plaas Roodewal 292.

Neem asseblief kennis dat die ontwikkellaar (MMM) self met die grondeienaars kontak sal maak om sodoende die moontlike registrasie van 'n serviuut te bespreek.

Ons vertrou dat u die bogenoemde in orde sal vind.

Kontak ons gerus indien u verdere inligting raknede die projek verlang.

Groete,

Hanlie Stander

Environmental Assessment Practitioner for MDA

mda Town & Regional Planners, Environmental & Development Consultants

9 Barnes Street | Westdene | Bloemfontein | 9301
P.O. Box 100982 | Brandhof | 9324
Tel: 051 447 1583 | Fax: 051 448 9839

From: Lappies Labuschagne [mailto:info@bloemplan.co.za]
Sent: 10 September 2019 08:43 AM
To: 'Hanlie Stander'
Subject: RE: 40673: Maselspoort Pipeline

Hanlie

Die voorgestelde pyplyn verwys.

Ek verwys ook spesifiek na die moontlike blou roete.

Indien die blou roete gebruik word gaan dit binne die agter kante van die plotte loop of binne Restant van die plaas No.292.

Laat weet asb.

LABUSCHAGNE
LAND SURVEYOR | LANDMETER INC/INGELYF
Reg. No. 2016/381429/21

Lappies Labuschagne
Professional Land Surveyor
Tel: 051 436 7921
Cell: 082 900 6881
Fax: 086 540 5484

From: Hanlie Stander [mailto:hanlie@mdagroup.co.za]
Sent: 05 September, 2019 15:47
To: info@bloemplan.co.za
Subject: 40673: Maselspoort Pipeline

Mr Labuschagne.

Met verwysing na ons telefoniese gesprek vandag, die volgende:

1. Sien asseblief 'n kaart rakende die bogenoemde projek hierby aangeheg.
2. Ook aangeheg, is 'n GoogleEarth Merker wat die drie voorgestelde roetes aandui.

Kontak ons gerus indien u verdere inligting rakende die projek verlang.

Groete,

Hanlie Stander

Environmental Assessment Practitioner for MDA

mda Town & Regional Planners, Environmental & Development Consultants

Marguerite Cronje:

Hanlie Stander

From: Marguerite Cronje <margueritecronje@gmail.com>
Sent: 18 September 2019 07:35 AM
To: Hanlie Stander
Subject: Re: 40673: Maselspoort Pipeline

Hi Hanlie

Ek neem kennis van roetes, dankie.

Groete

On Tue, 17 Sep 2019 at 15:56, Hanlie Stander <hanlie@mdagroup.co.za> wrote:

Marguerite,

Hoop dit gaan goed!

Sien asseblief die aangehegte kennisgewing, soos genoem deur Neil.

Groete,

Hanlie Stander

Environmental Assessment Practitioner for MDA

mda Town & Regional Planners, Environmental & Development Consultants

9 Barnes Street | Westdene | Bloemfontein | 9301

40673 Maselspoort 2018

Our Ref:

an agency of the
Department of Arts and Culture

T: +27 21 462 4502 | F: +27 21 462 4509 | E: info@sahra.org.za
South African Heritage Resources Agency | 111 Harrington Street | Cape Town
P.O. Box 4637 | Cape Town | 8001
www.sahra.org.za

Enquiries: Ragna Redelstorff
Tel: +27 (0)21 202 8651
Email: redelstorff@sahra.org.za
CaseID: 14979

Date: Monday March 23, 2020

Final Comment

In terms of Section 38(8) of the National Heritage Resources Act (Act 25 of 1999)

Attention: Mangaung Metropolitan Municipality

THE PROPOSED CONSTRUCTION OF A SECTION OF A WATER PIPELINE TO CONNECT THE BLOEMSPRUIT WWTW TO MOCKES DAM, BLOEMFONTEIN

The proposed project entails the assessment of three additional alternatives for the construction of a section of the already approved water pipeline (SAHRIS CaseID7513) as part of the Renosterspruit Water Recycling project by Manguang Metropolitan Municipality. The initial location for the pump station at the Renosterspruit is proposed to be changed within the existing boundaries of the North Eastern Waste Water Treatment Works. A draft BAR and Heritage Impact Assessment (HIA) were submitted with the application.

ROSSOUW, L. 2019. PHASE 1 HERITAGE IMPACT ASSESSMENT OF THREE PROPOSED PIPELINE ALTERNATIVES ALONG ROODEWAL MIDWAY ROAD BETWEEN THE RENOSTERSPRUIT AND BLESBOK AVENUE, BLOEMFONTEIN, FREE STATE PROVINCE.

The palaeontological impact of the proposed developments is considered low for each of the three alternative routes due to the low topography terrain and presence of a well-developed, superficial overburden that mantles potentially sensitive sediments of the Adelaide Subgroup (Beaufort Group, Karoo Supergroup). Palaeontologically insignificant dolerite is exposed near the southeastern boundary of the footprint area. The author found no Adelaide Subgroup outcrop and no evidence for the accumulation and preservation of intact fossil material within the superficial Quaternary sediments and the well-developed alluvial deposits exposed along the Renosterspruit.

There is also no evidence of *in situ* Stone Age archaeological material, rock art, prehistoric structures, Anglo Boer War sites, graves or buildings with historical significance older than 60 years within the boundaries of the three alternatives.

Recommendations:

Excavation exceeding depths of >1m into freshly exposed sedimentary strata (Adelaide Subgroup bedrock sediments) will require brief monitoring by a qualified palaeontologist.

an agency of the
Department of Arts and Culture

T: +27 21 462 4502 | F: +27 21 462 4509 | E: info@sahra.org.za
South African Heritage Resources Agency | 111 Harrington Street | Cape Town
P.O. Box 4637 | Cape Town | 8001
www.sahra.org.za

Enquiries: Ragna Redelstorff
Tel: +27 (0)21 202 8651
Email: rredelstorff@sahra.org.za
CaseID: 14979

Final comment

The SAHRA Archaeology, Palaeontology and Meteorites (APM) Unit has reviewed the HIA and has no objections against the proposed development subject to the following conditions that must be adhered to and must be incorporated into the Environmental Management Programme (EMPr) for implementation:

1. In the event of excavations that exceed 1m depth, the newly uncovered sedimentary strata must be monitored by professional palaeontologist during the excavation phase.

2. Should any objects of archaeological or palaeontological remains be found during construction activities, work must immediately stop in that area and the Environmental Control Officer (ECO) must be informed.

3. The ECO must inform the South African Heritage Recourse Agency (SAHRA) and contact an archaeologist and/or palaeontologist, depending on the nature of the find, to assess the importance and rescue them if necessary (with the relevant SAHRA permit). No work may be resumed in this area without the permission from the ECO and SAHRA.

4. If the newly discovered heritage resource is considered significant a Phase 2 assessment may be required. A permit from the responsible heritage authority will be needed.

5. A Chance Finds Procedures must be developed for the project to ensure that standard protocols and steps are followed should any heritage and/or fossil resources be uncovered during all phases of the project. These procedures should outline the steps and reporting structure to be followed in the instance that heritage resources are found. This must be included in the Environmental Awareness Plan.

6. The final BAR and appendices must be submitted to SAHRA upon submission to DEA. Should the project be granted Environmental Authorisation, SAHRA must be notified and all relevant documents submitted to the case file.

Should you have any further queries, please contact the designated official using the case number quoted above in the case header.

an agency of the
Department of Arts and Culture

T: +27 21 462 4502 | F: +27 21 462 4509 | E: info@sahra.org.za
South African Heritage Resources Agency | 111 Harrington Street | Cape Town
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Enquiries: Ragna Redelstorff
Tel: +27 (0)21 202 8651
Email: rredelstorff@sahra.org.za
CaseID: 14979

Date: Monday March 23, 2020

Yours faithfully

Ragna Redelstorff
Heritage Officer
South African Heritage Resources Agency

Phillip Hine
Manager: Archaeology, Palaeontology and Meteorites Unit
South African Heritage Resources Agency

ADMIN:
Direct URL to case: http://www.sahra.org.za/node/535297
(DESTEA, Ref:)

Terms & Conditions:

1. This approval does not exonerate the applicant from obtaining local authority approval or any other necessary approval for proposed work.
2. If any heritage resources, including graves or human remains, are encountered they must be reported to SAHRA immediately.
3. SAHRA reserves the right to request additional information as required.

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

DESTEA Reference: EMB/9(i) (ii), 12(ii)(a), 19/20/06
NEAS ref: FSP/EIA/0000336/2020
Enquiries: Ms. N. Molokwane
113 St. Andrews Building, Bloemfontein
Tel: (051) - 400 4831
Email: molokwanen@destea.gov.za

To: **Mr Neil Devenish**
MDA Town & Regional Planners,
Environmental & Development Consultants
P. O. Box 100982
Brandhof
Bloemfontein
9324

Tell: 051 447 1583
Email: neil@mdagroup.co.za

Dear Mr. Devenish,

RE: ENVIRONMENTAL AUTHORISATION FOR THE PROPOSED CONSTRUCTION OF A SECTION OF A WATER PIPELINE TO CONNECT THE BLOEMSPRUIT WWTW TO MOCKES DAM, BLOEMFONTEIN, FREE STATE PROVINCE.

The Department of Economic, Small Business Development, Tourism and Environmental Affairs (DESTEA) - 'the Department' has reviewed the Draft Basic Assessment Report for the above-mentioned project. Therefore you are requested to include and clarify the following in the Final Basic Assessment Report:

- The detailed project description specific to the proposed project.
- Provide the starting, middle and the end point of the proposed pipelines.
- Provide the size and length of the pipelines.
- Newspaper advertisement is not clear, kindly provide the visible one.

Regards,

Ms. N. Molokwane
Environmental Officer Production Grade A: EIM
Date: 14/05/2020

CHIEF DIRECTORATE: ENVIRONMENTAL QUALITY & PROTECTION
Private Bag X 20601 Tel +27 (0)51 400 4517
Bloemfontein Fax +27 (0)51 400 4842
9300 e-mail: nkoen@destea.gov.za
www.edtea.fs.gov.za

No further comments were received to date.
Any comments received will be forwarded to DESTEA.

APPENDIX E_5

Response to comments received

Commenting Party	Contact Detail	Comments and Response
Mr Lappies Labuschagne, on behalf of Emain Fourie (Remainder of Small Holdings 66, Roodewal)	051 436 7921 082 900 6881 info@bloemplan.co.za	**Comment:** Requested additional information on the layout of the proposed pipeline. Mr Labuschagne's client (Emain Fourie) wishes to register as an IAP for the proposed project. **Response:** Additional information, with a GoogleEarth Marker was forwarded to Mr Labuschagne. Copies of the dBAR w& fBAR was forwarded to all registered IAPs
Marguerite Cronje	margueritecronje@gmail.com 0827020547	**Comment:** Take note of proposed route. No need to register as an IAP, except of the proposed pipeline route change. **Response:** No response required.
SAHRA	R. Redelstorff 021 202 8651 Email: rredelstorff@sahra.org.za	**Comment:** 1. In the event of excavations that exceed 1m depth, the newly uncovered sedimentary strata must be monitored by professional palaeontologist during the excavation phase. 2. Should any objects of archaeological or palaeontological remains be found during construction activities, work must immediately stop in that area and the Environmental Control Officer (ECO) must be informed. 3. The ECO must inform the South African Heritage Recourse Agency (SAHRA) and contact an archaeologist and/or palaeontologist, depending on the nature of the find, to assess the importance and rescue them if necessary (with the relevant SAHRA permit). No work may be resumed in this area without the permission from the ECO and

		SAHRA. 4. If the newly discovered heritage resource is considered significant a Phase 2 assessment may be required. A permit from the responsible heritage authority will be needed. 5. A Chance Finds Procedures must be developed for the project to ensure that standard protocols and steps are followed should any heritage and/or fossil resources be uncovered during all phases of the project. These procedures should outline the steps and reporting structure to be followed in the instance that heritage resources are found. This must be included in the Environmental Awareness Plan. 6. The final BAR and appendices must be submitted to SAHRA upon submission to DEA. Should the project be granted Environmental Authorisation, SAHRA must be notified and all relevant documents submitted to the case file. **Response:** Noted. Copies of the dBAR w& fBAR was forwarded to all registered IAPs

Response to comments received from DESTEA:

1. **Background Information:**

An Environmental Authorisation was obtained by the Applicant for the proposed construction of a water pipeline from a section of the Bloemspruit WWTW to Mockes Dam, Bloemfontein in 2016. Note that no construction activities commenced to date. The said project can be summarised as the construction of a pipeline and pump station to transfer treated water from the existing waste water treatment plants to Mockes Dam. The water released in Mockes Dam will gravitate to Maselspoort Dam and will be utilised for the purpose of recycling. This form part of the Renosterspruit Water Recycling project by the applicant, i.e. the Mangaung Metropolitan Municipality. Please note that the initial location for the pump station was at the Renosterspruit. However, the applicant decided to construct the pump station within the existing boundaries of the North Eastern Waste Water Treatment Works and thus the pump station itself does not trigger a listed activity (as discussed in the 2016 documentation).

The current project entails the assessment of three additional alternatives for the construction of a section of the already approved pipeline. Please refer to Appendix A for more information on the locality of the alternatives to be investigated as part of the current project.

Bloemfontein experience water shortages from time to time. This is due to the fact that its main water source, the Welbedacht Dam is silted up, leaving only a small percentage of its original carrying capacity. A major pipeline also reached the end of its design life and bursts regularly.

In addition, water is typically released four times a year from Rustfontein Dam to feed the water need in Bloemfontein. Such water releases usually occurs during the late winter and spring periods, before the onset of the rainy season. These water releases are costly and alternative water resources had to be investigated.

Therefore, Mangaung Metropolitan Municipality has adopted a strategy to utilise local resources to its full potential by re-circulating as much water as possible, instead of transferring water from the Novo Transfer system. Every drop of water that is purified by recirculation will ensure less water to be transferred from the Welbedacht Dam (Caledon River) or possibly the planned Gariep Dam scheme (Caledon and Orange Rivers).

The construction of the proposed pipeline will enable the municipality to transport treated waste water that conforms to the DWS standards from the existing sewage plants to Mockes Dam. From here, the water will flow to Maselspoort Dam and treated at the Maselspoort Water Treatment Works (WTW) to potable water standards, when required.

This will ensure that the applicant will have sufficient volumes of water available during the dry season, without the costly water releases from Rustfontein Dam. It should be noted that surplus water released into Mockes Dam will not be treated at the Maselspoort WTW for potable water purposes. Rather, the surplus water will be released into the Modder River, corresponding to the current operating procedures.

It should be noted that Maselspoort WTW currently receives bulk water from Mockes Dam that receives water from the Modder River. This river is augmented by continuous effluent from Thaba Nchu and Botshabelo Waste Water Treatment Works (WWTWs). The Modder River flow is also augmented by the Novo Transfer Scheme and is also supported by natural storm water runoff during summer rains. Thus, the proposed project will add to the volume of treated water within the Maselspoort Dam / Modder River.

Please note that the proposed pipeline will only transport treated waste water that conforms to the DWS standards for water to be discharged after treatment at a waste water treatment plant. Please refer to Appendix G_1 for more information regarding the DWS standards for such water.

2. Detailed project Description specific to the proposed project:

Locality:
Please refer to Appendix A for more information on the proposed locality.

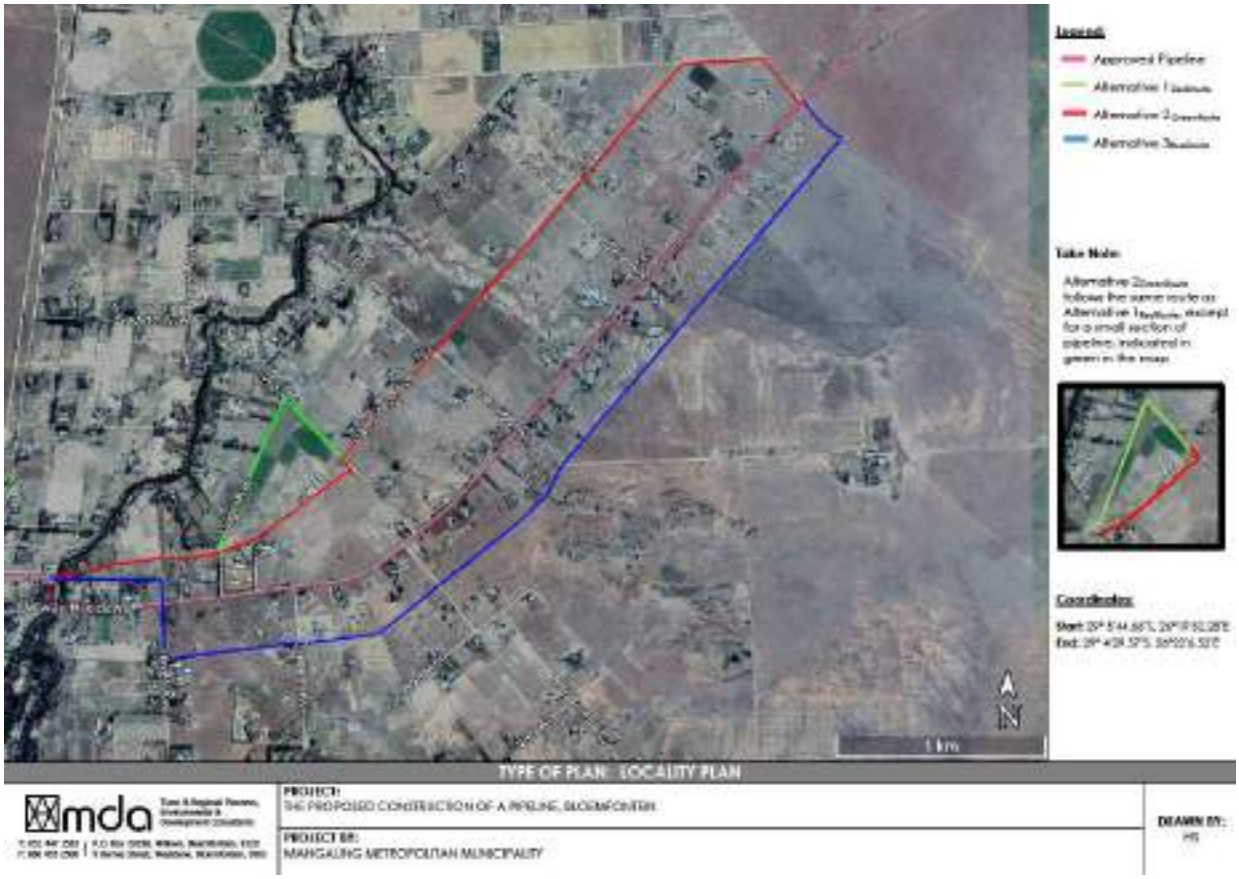
Type and Technology:
The latest Type and Technology alternatives will be incorporated as part of the proposed project.

The proposed pipe diameter was optimized by taking into consideration available energy and capital expense in order to utilize the available energy in the pipeline for hydropower generation.

The pipe material, GRP, has the highest resistance to corrosion and with its smooth glass like finish the lowest friction losses resulting in more available energy.

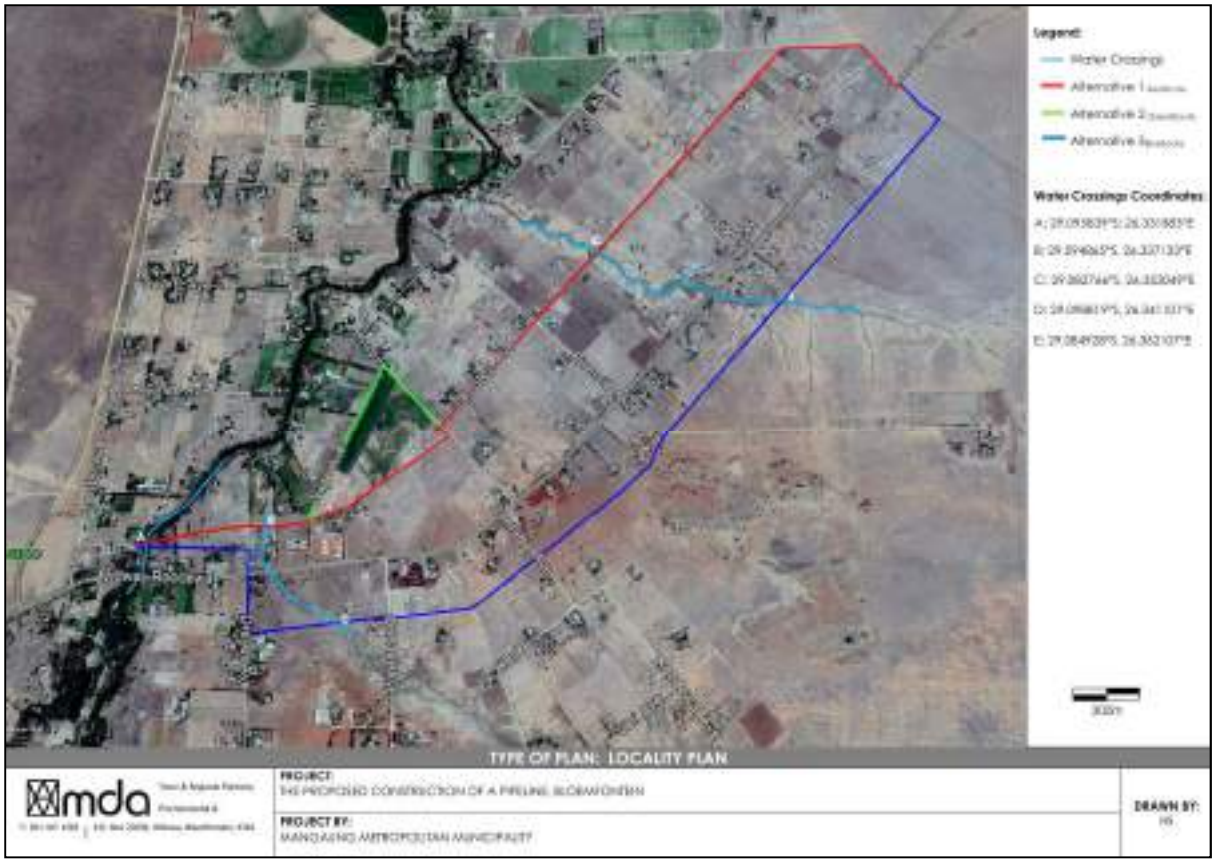
Design and Layout:
Please note that three different layout options are currently considered by the applicant. These options will be discussed throughout this document. The proposed pipeline will be constructed within the existing road reserves, as far as possible. The proposed project will also optimise energy solutions to ensure that less pumping is required. Please refer to Appendix A for more information on the proposed layout.

3. Provide the starting, middle and end point of the proposed pipelines:



Alternative	Start	Middle	End
Alternative 1RedRoute	29° 5'44.08"S; 26°19'52.46"E	29° 5'11.76"S; 26°20'57.63"E	29° 4'29.41"S; 26°22'6.48"E
Alternative 2GreenRoute	29° 5'44.08"S; 26°19'52.46"E	29° 5'11.76"S; 26°20'57.63"E	29° 4'29.41"S; 26°22'6.48"E
Alternative 3BlueRoute	29° 5'44.08"S; 26°19'52.46"E	29° 5'33.09"S; 26°21'18.58"E	29° 4'29.41"S; 26°22'6.48"E

Note that the following water crossings are associated with the proposed project:



4. Provide size and length of the pipelines:

Alternative	Size of pipeline	Length of pipeline
Alternative 1 RedRoute	The proposed section of pipeline associated with the current project will connect to sections of pipeline of with the EA was already obtained. The pipeline associated with the existing EA will connect the NE WWTW with Mocke's Dam. It is proposed that a 1.1m diameter Glass Reinforced Pipe be constructed. Note that sections at the water crossings may entail the construction of a different diameter pipeline.	Approximately 4 823m

Alternative 2$_{GreenRoute}$	The proposed section of pipeline associated with the current project will connect to sections of pipeline of with the EA was already obtained. The pipeline associated with the existing EA will connect the NE WWTW with Mocke's Dam. It is proposed that a 1.1m diameter Glass Reinforced Pipe be constructed. Note that sections at the water crossings may entail the construction of a different diameter pipeline.	Approximately 5 218m
Alternative 3$_{BlueRoute}$	The proposed section of pipeline associated with the current project will connect to sections of pipeline of with the EA was already obtained. The pipeline associated with the existing EA will connect the NE WWTW with Mocke's Dam. It is proposed that a 1.1m diameter Glass Reinforced Pipe be constructed. Note that sections at the water crossings may entail the construction of a different diameter pipeline.	Approximately 5 510m

Provide another copy of newspaper advertisement:

OIS
OMGEWINGSIMPAKSTUDIE

Notice is given in terms of

(a) Regulation 41(2)(a) of the Environmental Impact Assessment Regulations of 2014, No. 326 published in Government Notice No. 40772 (as amended 2017) under the National Environmental Management Act, 1998 (Act No. 107 of 1998) that applications for environmental authorization will be submitted to the Free State Department of Economic Development, Small Businesses, Tourism and Environmental Affairs (DESTEA)

(b) Regulation 17(3)(a) of the Regulations Regarding The Procedural Requirements for Water Use License Applications and Appeals of 2017 No. R. 267 published in Government Notice No. 40713 of 24 March 2017 under the National Water Act (Act 36 of 1998) Section 21 as amended, that applications for a Water Use License will be submitted to the Department of Water and Sanitation (DWS)
(if required)

for the following projects:

(a) Proposed construction of a pipeline to transfer treated water from the existing waste water treatment plants to Mockes dam.
Proponent: Mangaung Metropolitan Municipality.
Locality: From the WWTW at Liquinda (Bloemfontein), towards Mockes Dam.

(b) The proposed construction of a diesel depot on Portion 1 of Plot 42, Estoire, Bloemfontein.
Proponent: Mack$ Petroleum (PTY) LTD.

For more information or to register as an interested and / or affected party, submit your name, contact information and interest / comments regarding the environmental impact of the proposed projects to **MDA (hanlie@mdagroup.co.za 051 447 1583 / P.O. Box 100982 Brandhof Bloemfontein, 9324) within 30 days of this notification.**

www.volksblad.com OM TE ADVERTEER SKAKEL BFN: T: 051 404 7757 · F: 051 447 2940 KBY: T: 053 831 2331 · F: 053 831 2330 · E: adverts@volksblad.com / Anthea.arends@volksblad.com (Kimberley)

Geklassifiseerd

STERFGEVALLE

STEYN

† 06/03/1941 - 24/06/2019

Die troosdiens van Petronella Staffelina, in lewe van Bloemfontein, vind plaas vanuit Rosenhein Aftree Oord op Woensdag, 10 Julie 2019 om 14:00. Die verassing vind privaat plaas.

BLOEMFONTEIN, 051 447 1011
SAMBA kontrakteur vir uitvoering van begrafnisse
AVBOB We're here for you

POTGIETER

18/01/1952 - 24/06/2019

Die troosdiens van Hendrik George (Bok), 67 jaar, in lewe van Bloemfontein, vind plaas vanuit die NG Kerk Pellissier, Vlakfonteinlaan op Dinsdag 2 Julie 2019 om 11:00. Die verassing vind privaat plaas.

Reëlings: Tel: 051 448 8566
SAMBA kontrakteurs vir die uitvoering van begrafnisse
Emmanuel

GREYSON JEWEL

Passed away peacefully on 21/06/2019

Deeply mourned by her family

The memorial service of Jewel formally of Serenitas, Bloemfontein will take place on Wednesday 10 July 2019 at 10h00 at the Andrew Murray Community Church, 34 Alexander Avenue, Arboretum, Bloemfontein. By request no flowers or donations.

ALGEMENE KENNISGEWINGS

GEMEENSKAPS-KENNISGEWINGS

1210

The following vehicle will be sold by public auction to recover debt owing. The vehicle will be sold to recoup outstanding debt, 30 (thirty) days after publication. The vehicle is an **ISUZU 2.4** with registration number **DXD 131 FS**, to be sold to recover outstanding debt. **DCW ATTORNEYS Danial Wessels 4 Brill Street Westdene Bloemfontein (051) 447 0805 dan@dcwlaw.co.za**

PERSOONLIKE DIENSTE

LENINGS

1445

BRIDGING CASH while waiting for **PENSION/PACKAGE/ PROPERTY SALE.** Payout (lump sum only). 086 110 1388/ 076 886 7655.

TE KOOP

ALLERLEI

1655

DESLEY KOOP EN VERKOOP
BENODIG DRINGEND
Tweedehandse en Antieke Huishoudelike Meubels
INRUILINGS WELKOM
Skakel vir GRATIS Tuiskwotasies
051 444 1638
Victoriaweg 66 Willows
www.desley.co.za

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

GESLAGDE SKAAP C GRAAD R54.90 PER KG. LAM R74.90 PER KG. SKAKEL LOUISE ☎ 071 603 2877 BFN.

Kom besoek ons gerus van die 20ste tot die 30ste Junie vir die beste waarde vir geld-winskope **Cash Converters 051 430 5468**

WILD KARKASSE . SPRINGBOK, BLESBOK, ROOIBOK. SKAKEL LOUISE ☎ 071 603 2877 BFN.

ALGEMENE & HUISDIENSTE

BOUWERK & KONSTRUKSIE

1801

ALGEMENE NUTSMAN: Staalwerk, herseël van dakke, krane, verf. Skakel 083 707 7967.

BLITZ BETON: Vir betonheinings, randstene en vervang van bestaande betonheinings. **Skakel 051 433 1077/ 082 441 7413.**

BOU 104 VKM BAK-STEENHUISE met teëldak teen R299 000. Doen ook alle aanbouings en skermmure. ☎ **082 625 6613.**

ELEKTRIES

1810

1-CALL Appliance Repairs: Alle wasmasjiene, tuimeldroërs, ys-/vrieskaste. Oop Ma. - Sa. Herstel binne 24 uur by u huis! ☎ **073 363 9075. Hoewes en Plase**

HERSTELWERK

1816

HERSTEL van yskaste by u huis, asook gas. Soek dringend yskaste, werkend of nie. Gratis kwotasie. **MSE. 082 573 4737.**

TE HUUR

1820

SALE te huur op skouterrein vir troues, funksies en spesiale skoue. Persele ook beskikbaar op langtermynbasis. Skakel **Juanita by 051 448 9894/5/6.** www.bloemshowgrounds.co.za

YSKASTE/VRIES-KASTE: Te huur en herstelwerk aan huishoudelike toerusting. **Bloemfontein Fridge Hire 051 522 4616/ 082 485 6940.**

LOODGIETERS

1855

Oranje Loodgieters: Algemene loodgieterswerk en verstopte rioolpype. **076 493 5503.**

VERVOER & BERGING

1870

Algemene Vervoer Verwydering van tuinafval en bourommel asook ry van trekke (ook platteland). Eenmalige skoonmaak van erf en sypaadjies. **Skakel 071 301 3016**

ARCHIE'S MEUBELVERVOER Landwyd ook. Jare se ondervinding en versekering. **Sel. 083 282 8052**

LE ROUX KOTZE: MEUBELVERVOER EN VERHUISING. ☎078 304 9372.

SAKKIE ☎ 082 879 8280. VERWYDER ROMMEL EN TREKKE.

BOME

1871

AAA Tree-Felling: 40% afslag. ☎**Joubert 083 240 7905.**

AFSAAG van bome: Gratis kwotasie. Annemie 083 480 7999.

LANDBOU

BOORGATE

2208

BOOR EN SKOON-MAAK van watergate: Bloemrock Drilling. Hennie 082 780 9063/ Isak 072 189 6034

BOOR, skoonmaak en toets van gate. Installeer pompe. 35 jaar in die bedryf. Skakel Dawie Coetzee 083 368 3725/Jacques Coetzee 083 486 9539.

PRODUKTE

Integri Feeds, geregistreede voere. Wildspille en Ram,lam en ooi : R175/50KG Droogte: R160/50KG Suiwel 19% (ureum vry) R165/40KG Blokke en vele ander pille vir diere. **Skakel 072 9289 635 Bloemfontein**

* Lusern: R80
* Hawer: R75
* Mielies R150 vir 50
* Straight Run
* Gemaalde Lusern

Skakel Francois 083 468 9746

SAKE

TE KOOP

2405

Partytjie winkel met unieke voorraad en gevestigde kliente . Uitstekend geleë. Groot potensiaal en plesier om te bestuur. Goeie inkomste. Prys R880 000. **Skakel Pieter 082 483 2953 NRE.**

SAKE GELEENTHEDE

2415

Kan jy belê in beesboerdery? Sal jy weidings-praktyk kan ontwikkel en op die plaas wil woon? ☎ **Gert 082 802 2464.**

VAKANSIE & REIS

AKKOMMODASIE

2635

JEFFREYSBAAI: PINNAQUIN-4-STER-vakansie-eenhede met seeuitsig, vir 5 persone. 5 min. se stap na strand, winkels en restaurante. Pensioenarisafslag. 0422961111/0828234662/ Johan 082 552 3642. Pinnaquin@pinnaquin.co.za www.pinnaquin.co.za **4-STER-gastehuis:** 0422960008/0827751568.

VOERTUIE

BAKKIES/4X2's TE KOOP/HUUR

3010

Bakkie Sentrum
soek dringend bakkies en dubbelkajuite om te koop.
082 339 9071
051 448 5740
bakkiesentrum@vodamail.co.za
BESOEK GERUS ONS WEBTUISTE BY:
www.bakkiesentrum.co.za

MOTORS TE KOOP

3025

2005 Chevrolet Spark LS. Baie goeie algemene en meganiese kondisie. 87 900km. R37 000 ohb. ☎ **John 078 998 0184**

VOERTUIE GESOEK OM TE KOOP

3075

Soek voertuie vir kontant. Skakel 051 447 2399 of 084 208 2565.

EIENDOMME

DUETS TE KOOP

3240

LHP - R 1 795 000 Moderne 3 slpk duet met dubbelgeriewe Oopplan leefareas. Skou Sondag: 15h00 – 17h00 **AnnaMarie 083 981 4089**

PLASE TE KOOP

3245

Wesselsbron: 252ha Netjiese saaiplaas, 75ha besproeiing (2 x 5 toring), 120ha droëland, 57ha weiding, geen huis of verbeterings. **Louis 061 304 3249 louis@farmexpert.co.za**

WOONSTELLE TE HUUR

3250

1 Man woonstel - Onmiddellik beskikbaar. Ten volle toegerus en gemeubileerd, DStv. Onderdak parkering, Pellissier. R4 400 + R400 krag. Deposito betaalbaar. **Andre - 083 6547361**

TUINWOONSTELLE TE HUUR

3265

1 Bedroom Garden Cottage to rent in North Cottage in Helicon Heights with a private garden, covered parking and own entrance. Large lounge with kitchenette, neat bathroom and lots of cupboards throughout. Kitchen has built-in stove, recently painted. Pets Welcome Available 1 Aug 2019. R3 900 excl elec. **Contact Diana 082 8077 678**

HUISE TE KOOP

3275

Noordhoek: Dringende verkoop. 3 Slk huis , plus woonstel, swembad **R699 000 GEEN AGENTE Skakel 079 7732 069**

KAMERS TE HUUR

3315

Langenhovenpark. 1 Kamer R3 250 p.m. W en L ingesluit **Skakel 082 298 1053**

MEENTHUISE TE KOOP

3330

LHP - R 795 000 2 Slpk eenheid in gewilde kompleks. Koopkrag. Swembad in kompleks. ☎ **Annamarie 083 981 4089.**

MEENTHUISE TE HUUR

3335

Pentagonpark
• **Eenhede:** R9 200 p.m. 3 Slk met dubbel geriewe Meenthuis in kompleks met swembad, baie veilig.
• **Luukse** Meenthuis met beste uitkyk en alles wat u benodig R10 200 p.m.
Skakel 082 807 2534.

BETREKKINGS

3600

ALGEMEEN

3680

Finansiële bestuurder B Com (Accounting) met 5 jaar ondervinding. **Stuur asb u CV en finansiële verwagting na js@property commerce.co.za**

Gevestigde Makelaar benodig 'n **kort-termyn eise persoon** (Junior pos). Eise ondervinding is 'n vereiste. **Stuur CV na heckmar@ heckmar.co.za** Sluitingsdatum 5 Julie 2019

ONTVANGS/ADMIN KLERK
Gevestigde mediese spesialis praktyk in Bloemfontein benodig 'n dinamiese hardwerkende persoon as Ontvangsdame met 'n positiewe gesindheid.
Die suksesvolle kandidaat moet aan die volgende vereistes voldoen:
* Ten volle tweetalig wees en oor 'n Graad 12 kwalifikasie / Sekretariële Diploma beskik;
* Rekenaargeletterd wees en goed en akkuraat kan tik.
* 5+ Jaar toepaslike ondervinding in 'n mediese praktyk (Ontvangs);
* Goed met invorderings en admin.
* Goeie skakeling met pasiënte en mediese fondse;
* 25+ jaar oud wees.

Vyfdag werksweek. Salaris onderhandelbaar rondom R14 000.00 (veertienduisend) p.m. ander voordele. Indien jy aan bogenoemde vereistes voldoen, stuur jou CV na **hannatjie@ effectivepers.co.za.** Indien jy nie binne 14 dae terugvoer kry nie, beskou jou aansoek as onsuksesvol.

SCHOEMANPARK Gholf-klub is opsoek na 'n voltydse dame met rekeningkundige agtergrond **Stuur CV na: finance.schoemanpark@ gmail.com**

Transformer Sales Consultant / Sales Manager
A sales person with transformer/electrical knowledge required. In-house training will be given. 4-5 Years' experience in sales and tender processes will be beneficial. Must have a proven track record of exceptional client service, must be computer literate, willing to travel. **E-mail CV to jobs@fstx.co.za**

VERSORGER VIR OU DAME OP 'N PLAAS IN RICHMOND, NK. VERGOEDING TUSSEN R6 500 PM. ETES EN VERBLYF INGESLUIT. **STUUR CV NA locummed@gmail.com of skakel RETHA 083 445 4214**

Skakel Kim Morgan by 051 404 7825 kim.morgan@volksblad.com vir geklassifiseerde- of blok-betrekking-advertensies

REGSKENNISGEWINGS & TENDERS

HOFBEVELE/ SEKWESTRASIES/ LIKWIDASIES

4005

NOTICE

MAREE & VENNOTE PROKUREURS/ ATTORNEYS

IN THE HIGH COURT OF SOUTH AFRICA
FREE STATE DIVISION, BLOEMFONTEIN
Case No: 821/2019
Before the Honourable Justice JP Daffue
On the 30th day of May 2019
In the matter between:
STANDARD BANK OF SOUTH AFRICA LIMITED Applicant
and
OLIVERS RUST LANDGOED (PTY) LIMITED Respondent

Having considered the documents filed in this matter and having heard argument IT IS ORDERED THAT:
1. The Respondent Company is hereby placed under Provisional Winding-up in the hands of the Master of the Hight Court.
2. SA Provisional Order is hereby issued calling upon all interested parties to show cause, if any, to the Court on the 11th day of July 2019 at 09:30 why a Final Order of Winding-up should not be granted against Respondent Company.
3. Service of this rule, and a copy of the Notice of Motion and annexures must be effected on the Respondent Company at its registered Office, or its principal place of business within the court's jurisdiction.
4. This order must, without delay, be published in Die Volksblad and The Government Gazette.
5. A copy of the winding-up order must be served on -
5.1 Every registered trade union that as far as the Sheriff can reasonably ascertain, represents any of the employees of the Respondent Company.
5.2 The employees of the Respondent Company by affixing a copy of the application and provisional order on any notice board to which the employees have access inside the Respondent Company's premises or if there is no access to the premises by the employees, by affixing a copy to the front gate or front door of the premises from which the Respondent Company conducted any business.
5.3 The South African Revenue Services.
6. The sheriff must ascertain whether the employees of the respondent are represented by a Trade Union and whether there is a notice board on the premises to which the employees have access.
BY ORDER OF THIS COURT
COURT REGISTRAR
MAREE & PARTNERS

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

OIS OMGEWINGSIMPAKSTUDIE

4045

Notice is given in terms of

(a) Regulation 41(2)(a) of the Environmental Impact Assessment Regulations of 2014, No. 326 published in Government Notice No. 40772 (as amended 2017) under the National Environmental Management Act, 1998 (Act No. 107 of 1998) that applications for environmental authorization will be submitted to the Free State Department of Economic Development, Small Businesses, Tourism and Environmental Affairs (DESTEA)

(b) Regulation 17(3)(a) of the Regulations Regarding The Procedural Requirements for Water Use License Applications and Appeals of 2017 No. R. 267 published in Government Notice No. 40713 of 24 March 2017 under the National Water Act (Act 36 of 1998) Section 21 as amended, that applications for a Water Use License will be submitted to the Department of Water and Sanitation (DWS) (if required)

for the following projects:

(a) Proposed construction of a pipeline to transfer treated water from the existing waste water treatment plants to Mockes dam. Proponent: Mangaung Metropolitan Municipality. Locality: From the WWTW at Liquinda (Bloemfontein), towards Mockes Dam.

(b) The proposed construction of a diesel depot on Portion 1 of Plot 42, Estoire, Bloemfontein. Proponent: Mack$ Petroleum (PTY) LTD.

For more information or to register as an interested and / or affected party, submit your name, contact information and interest / comments regarding the environmental impact of the proposed projects to **MDA (hanlie@mdagroup.co.za 051 447 1583 / P.O. Box 100982 Brandhof Bloemfontein, 9324) within 30 days of this notification.**

VERKOOP VAN SAAK

4085

Kennisgewing van verkoping van besigheid: Kennis word hiermee gegee in terme van Artikel 34(1) van die Insolvensiewet Nr. 24 van 1936, soos gewysig, aan alle belanghebbendes en krediteure van Sandstone Tiles BK h/a Mugg & Bean Northridge Mall, registrasienommer 2008/123749/23 (die "verkoper") dat die Beslote Korporasie voornemens is om die besigheid, klandisiewaarde en bates van die besigheid bekend as Mugg & Bean Northridge Mall, geleë te Winkel 3, Northridge Mall, Kenneth Kaundaweg, Helicon Heights, Bloemfontein, tesame met alle huurkontrakte as 'n lopende saak, te verkoop aan 'n nuwe eienaar, welke koper die besigheid sal voortsit vir eie rekening en voordeel. Prokureurs namens die Verkoper: Harm Schreurs, MSDP Maritz, Schreurs and Du Preez Attorneys, 128 Monument Road, Kemptonpark, Johannesburg, 1620. Kontaknr. 011 972 1360

Notice of sale of business: Notice is hereby given in terms of Section 34(1) of the Insolvency Act, No. 24 of 1936, as amended, to all interested parties and creditors of Sandstone Tiles CC t/a Mugg & Bean Northridge Mall, registration number 2008/123749/23 (the "seller") that it intends to sell its business, goodwill and assets forming part of its business known as Mugg & Bean Northridge Mall, situated at Shop 3, Northridge Mall, Kenneth Kaunda Road, Helicon Heights, Bloemfontein, together with its assets forming part of the said property and inclusive of all lease agreements, as a going concern to the new owner, which will carry on the business for its own account and benefit. Attorneys for the seller: Harm Schreurs MSDP Maritz Schreurs and Du Preez Attorneys 128 Monument Road Kempton Park Johannesburg, 1620 Tel 011 972 1360

BOEDELKENNIS-GEWINGS

BOEDELS: KREDITEURE EN DEBITEURE

4201

Standard — This estate is being administered by Standard Trust Limited

AM PIETERSE
In the estate of the late ALETTA MARIA PIETERSE, ID No. 420528 0068 08 2, date of birth 28 May 1942, date of death 26 February 2018, of 11 Jan Kemp Crescent, General De Wet, Bloemfontein.
No. 003067/2018.
The First and Final Liquidation and Distribution Account in the above estate will lie for inspection at the office of the Master of the High Court, Bloemfontein and at the office of the Magistrate, for a period of three weeks from the date of publication hereof.
Standard Trust Ltd
Ref: MS
Private Bag X11
Suite No 22
Brandhof
9324

FNB

AP TOLKEN
Estate of the Late ADRIAAN PIETER TOLKEN, who died on 27 February 2019, Identity Number 590424 5042 08 8, of 5 Langeberg Avenue, Carters Glen, Kimberley, 8301.
ESTATE NO: 001485/2019.
Creditors in the above Estate are hereby called upon to file their claims with, and to pay their debts, to the undersigned within thirty (30) days from date of publication hereof.
FNB Fiduciary (Pty) Ltd
P.O Box 12619
Brandhof
9324
Vinette Kock
+27 87 343 1814

WAARSKUWING

Lesers moet hulle vergewis van alle dienste wat in advertensies aangebied word en kwotasies en deposito's wat vereis word nagaan voordat hulle enigiets aanvaar. Dit is die verbruiker se verantwoordelikheid om die adverteerder met wie hulle sake wil doen, se getuigskrifte na te gaan.

Volksblad Geklassifiseerd bied 'n diens aan adverteerders deur hulle dienste en/of produkte te bemark, maar aanvaar egter geen verantwoordelikheid of aanspreeklikheid vir enige skade of eise van lesers teen die adverteerder nie.

SOEK, KOOP, VERKOOP VIR ALLE GEKLASSIFISEERDE ADVERTENSIES

Note: No further comments were received to date.
Any comments received will be forwarded to DESTEA.

APPENDIX E_6

Proof of submission of dBAR to registered parties

Proof of submission / delivery
dBAR: 40673
mda Maselspoort Pipeline

Organisation	Contact person and contact details	Proof of submission
The Municipal Ward Councillor: Ward 47	Ward Councillor, Ward 47 7 Barnes Street Westdene Bloemfontein 9301 Mokgadi Kganakga mokgadikganakga99@gmail.com 083 886 9494	
The Municipal Ward Councillor: Ward 44	Selmé Pretorius 7 Barnes Street Westdene Bloemfontein 9301 082 824 2047 selpret@gmail.com	13 Feb 2020
The Municipal Ward Councillor: Ward 17	Thomas Ferreira 7 Barnes Street Westdene Bloemfontein 9301 082 631 3898 Thomas.crusaders@gmail.com	
Mangaung Metro Municipality City Manager	The City Manager P.O. Box 3704 Bloemfontein 9300	ORDINARY PARCEL RE 935 702 349 SA CUSTOMER COPY 361016
Mangaung Metro Municipality: Enviornmental Division	Me. Mpolokeng Kolobe P.O. Box 3704 Bloemfontein 9300	Mmorgan 11/02/2020
Mangaung Metro Municipality: Planning Division	Collin Dihemo P.O. Box 3704 Bloemfontein 9300	11/2/2020 S.A POST OFFICE 2020 -02- 11 No.: 3 BRANDHOF - 9321

From: Hanlie Stander <hanlie@mdagroup.co.za> Sent: Tue 2020/05/05 11:45
To: 'Lappies Labuschagne'
Cc:
Subject: 40673: Maselspoort Pipeline

Mr Labuschagne,

With reference to our telephonic discussion earlier, the following:

1. The dBAR document was delivered to your office.

2. The landowner of Small Holdings 66, Roodewal has no comments on the above mentioned document.

Please confirm the above.

Do not hesitate to contact us should you require additional information on the said project.

Kind regards,

Hanlie Stander

Environmental Assessment Practitioner for MDA

mda Town & Regional Planners, Environmental & Development Consultants

9 Barnes Street | Westdene | Bloemfontein | 9301
P.O. Box 100982 | Brandhof | 9324
Tel: 051 447 1583 | Fax: 051 448 9839

From: Lappies Labuschagne <info@bloemplan.co.za> Sent: Tue 2020/05/05 11:49 AM
To: 'Hanlie Stander'
Cc:
Subject: RE: 40673: Maselspoort Pipeline

Hanlie

Aangesien die voorgestelde roete, wat met blou aangedui is, binne die grense van die Restant van die Plaas Roodewal 292 val en nie deur Plot 66 Roodewal loop nie het die eienaars geen beswaar nie.

LABUSCHAGNE
LAND SURVEYOR | LANDMETER INC/INGELYF
Reg. No. 2016/381429/21

Lappies Labuschagne
Professional Land Surveyor
Tel: 051 436 7921
Cell: 082 900 6881
Fax: 086 540 5484

Hanlie Stander

From: Hanlie Stander <hanlie@mdagroup.co.za>
Sent: 05 May 2020 12:42 PM
To: 'Marguerite Cronje'
Subject: 40673: Maselspoort Pipeline

Marguerite,

Regarding our telephonic conversation earlier today, the following:

1. MDA forwarded the initial notification regarding the proposed project to you on 17 September 2019.

2. It was confirmed that you do not wish to register as an IAP.

3. MDA will keep you updated and provide you with information, should the proposed layout change.

4. Please see the following link for additional information on the said project, for interest's sake:
https://wetransfer.com/downloads/5d5e5470b005f86e6c8aa9b66f85795620200429190141/2664a4fe968e8d46b523774853df2c5a20200429190221/67e876
5. Note that WeTransfer will delete the files within a day, should you not download the documentation.

We trust that you will find the above in order.

Please do not hesitate to contact us should you require additional information on the said project.

Kind regards,

Hanlie Stander

Environmental Assessment Practitioner for MDA

mda Town & Regional Planners, Environmental & Development Consultants

9 Barnes Street | Westdene | Bloemfontein | 9301
P.O. Box 100982 | Brandhof | 9324
Tel: 051 447 1583 | Fax: 051 448 9839

PUBLIC PARTICIPATION PROCESS FOR ENVIRONMENTAL IMPACT ASSESSMENT: BASIC ASSESSMENT & WATER USE AUTHORISATION PROCESS

Date: 10 February 2020

Notice is given in terms of

(a) Regulation 41(2)(a) of the Environmental Impact Assessment Regulations of 2014, No. 326 published in Government Notice No. 40772 (as amended 2017) under the National Environmental Management Act, 1998 (Act No. 107 of 1998) that an application for environmental authorization will be submitted to the Free State Department of Economic Development, Small Businesses, Tourism and Environmental Affairs (DESTEA)

(b) Regulation 17(3)(a) of the Regulations Regarding the Procedural Requirements for Water Use License Applications and Appeals of 2017 No. R. 267 published in Government Notice No. 40713 of 24 March 2017 under the National Water Act (Act 36 of 1998) Section 21 as amended, that an application for a Water Use License will be submitted to the Department of Water and Sanitation (DWS)

for the following project:

Project:	Construction of a pipeline to transfer treated water from the existing waste water treatment plants to Mockes dam. The water released in Mockes dam will gravitate to Maselspoort dam and will be utilised for the purpose of recycling.
Locality:	Please refer to attached map
Proponent:	Mangaung Metropolitan Municipality

In order to register as an interested and / or affected party, kindly submit your name, contact information and interest / comments regarding the environmental impact of the proposed project to MDA before 12 March 2020.

Environmental Consultants:

mda

P.O. Box 100982
Brandhof
Bloemfontein
9324

Tel: 051 447 1583
Fax: 051 448 1839

Contact person:
Hanlie Stander
hanlie@mdagroup.co.za

B Monroe Received 7/05/2020

(Department of Police, Roads and Transport)

APPENDIX F

Impact Assessment

IMPACT ASSESSMENT

THE PROPOSED CONSTRUCTION OF A SECTION OF A WATER PIPELINE TO CONNECT THE BLOEMSPRUIT WWTW TO MOCKES DAM, BLOEMFONTEIN

Applicant: Mangaung Metro Municipality

MDA Ref No: 40673 2018

Date: April 2020

mda

Town & Regional Planners,
Environmental & Development

Physical Address: 9 Barnes Street,
Westdene, Bloemfontein, 9301
Postal Address: PO Box 100982,
Brandhof, 9324
Tel: 051 4471583, Fax: 086 455 2568
E-mail: admin@mdagroup.co.za

1. METHODOLOGY

1.1. Impact assessment must take into account the nature, scale and duration of effects on the environment whether such effects are positive (beneficial) or negative (detrimental). Each issue / impact is also assessed according to the project stages from planning, through construction and operation to the decommissioning phase. Where necessary, the proposal for mitigation or optimization of an impact is noted. A brief discussion of the impact and the rationale behind the assessment of its significance has also been included.

1.2. A rating system is applied to the potential impact on the receiving environment and includes an objective evaluation of the mitigation of the impact. In assessing the significance of each issue the following criteria (including an allocated point system) is used:

Table 1: Criteria for the classification of an impact		
Nature	A brief description of the environmental aspect being impacted upon by a particular action or activity is presented.	
Extent (Scale)	Considering the area over which the impact will be expressed. Typically, the severity and significance of an impact have different scales and as such bracketing ranges are often required. This is often useful during the detailed assessment phase of a project in terms of further defining the determined significance or intensity of an impact.	
	Site	Within the construction site
	Local	Within a radius of 2 km of the construction site
	Regional	Provincial (and parts of neighbouring provinces)
	National	The whole of South Africa
Duration	Indicates what the lifetime of the impact will be.	
	Short-term	The impact will either disappear with mitigation or will be mitigated through natural process in a span shorter than the construction phase
	Medium-term	The impact will last for the period of the construction phase, where after it will be entirely negated
	Long-term	The impact will continue or last for the entire operational life of the development, but will be mitigated by direct human action or by natural processes thereafter

Table 1: Criteria for the classification of an impact		
	Permanent	The only class of impact which will be non-transitory. Mitigation either by man or natural process will not occur in such a way or in such a time span that the impact can be considered transient
Intensity	Describes whether an impact is destructive or benign.	
	Low	Impact affects the environment in such a way that natural, cultural and social functions and processes are not affected.
		It is important to note that the status of an impact is assigned based on the status quo – i.e. should the project not proceed. Therefore not all negative impacts are equally significant.
	Medium	Effected environment is altered, but natural and social functions and processes continue albeit in a modified way, cultural
	High	Natural, cultural and social functions and processes are altered to extent that they temporarily cease
	Very high	Natural, cultural and social functions and processes are altered to extent that they permanently cease
Probability	Describes the likelihood of an impact actually occurring.	
	Improbable	Likelihood of the impact materializing is very low
	Possible	The impact may occur
	Highly probable	Most likely that the impact will occur
	Definite	Impact will certainly occur
Significance	Significance is determined through a synthesis of impact characteristics. It is an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required.	
	Low impact	No permanent impact of significance. Mitigatory measures are feasible and are readily instituted as part of a standing design, construction or operating procedure
	Medium impact	Mitigation is possible with additional design and construction inputs

Table 1: Criteria for the classification of an impact		
	High impact	The design of the site may be affected. Mitigation and possible remediation are needed during the construction and/or operational phases. The effects of the impact may affect the broader environment
	Very high impact	The design of the site may be affected. Intensive remediation as needed during construction and/or operational phases. Any activity which results in a "very high impact" is likely to be a fatal flaw
Status	Denotes the perceived effect of the impact on the affected area.	
	Positive	Beneficial impact
	Negative	Deleterious or adverse impact
	Neutral	Impact is neither beneficial nor adverse

The suitability and feasibility of all proposed mitigation measures will be included in the assessment of significant impacts. This will be achieved through the comparison of the significance of the impact before and after the proposed mitigation measure is implemented.

DESCRIPTION AND ADDRESSING OF POSSIBLE IMPACTS, ISSUES AND CUMULATIVE IMPACTS

Developments such as these do have, like many other types of developments, various direct but also indirect impacts on the environment. These impacts have to be managed in order to have the minimum environmental impact and the maximum benefit to man.

Issues identified during the Basic Assessment process are discussed and assessed below:

1. VEGETATION DESTRUCTION						
Assessment						
Mitigation Status	**Extent**	**Duration**	**Intensity**	**Probability**	**Significance**	**Status**
Without Mitigation	Local	Permanent	Very high	Definite	High	Negative
With Mitigation	Site	Long term	High	Definite	Medium	Negative
Recommendation						
Phase	**Description of recommendation**					
General	• Please refer to the Specialist Reports in Appendix D for more recommendations					
Planning Phase	• None					
Construction phase and operational phase	• Establishment of alien / invader vegetation will be monitored and these species will be removed by hand or by an approved chemical before gestation thereof. • Vegetation clearance will be limited to the required area. • A permit for the removal of protected plant species will be obtained before the removal of these species (if any). • Care should be taken to limit unnecessary destruction of the natural vegetation. • All human movement and activities must be contained within designated construction areas and the planned site access road in order to prevent peripheral impacts on surrounding natural habitat. • No fire-wood may be collected in the veld without permission from the landowner. • Alien control and monitoring programme must be developed. • Visual inspections should be undertaken regularly to ensure environmental compliance. • If erosion is evident, proper erosion control measures should be implemented as soon as possible.					
Post construction phase and rehabilitation phase	• The alien control and monitoring programme used during the construction and operational phase must be carried over into the post construction and rehabilitation phase. • Erosion should be prevented as far as possible and attended to, as serious erosion may occur at barren areas.					

1. VEGETATION DESTRUCTION	
	• Return and spread topsoil cover (to original depth, or as recommended by the ecological specialist) over rehabilitated area. • Vegetation should be allowed to re-establish naturally over disturbed area to be rehabilitated. • Areas which show no vegetation growth nine months after completion of the rehabilitation work, must be ripped, additional topsoil spread and seeded with indigenous grass species / hydro-seeded. • Species, especially grasses, trees and shrubs occurring in the region must be used to rehabilitate disturbed areas. • Keep animals away from the site, at least until the vegetation has re-established sufficiently.

2. LOSS OF SOIL						
Assessment						
Mitigation Status	**Extent**	**Duration**	**Intensity**	**Probability**	**Significance**	**Status**
Without Mitigation	Regional	Permanent	Medium	Definite	High	Negative
With Mitigation	Local	Long-term	Medium	Definite	Medium	Negative
Recommendation						
Phase	**Description of recommendation**					
General	• Please refer to the Specialist Reports in Appendix D for more recommendations					
Planning Phase	• No environmental mitigation measures is required during the planning phase on the proposed site, as no mitigation measures are to be implemented on site during the planning phase. • However, the engineers, specialists and environmental consultants took various factors into consideration, to be implemented during the construction / operational phase.					
Construction phase and operational phase	• Store stripped topsoil in an approved location and in an approved manner for later re-use in the rehabilitation process, for example: - Bricks may be placed around the stockpiles, to limit the loss thereof due to rainy events. - Stockpiles should not be higher than 1.5 m. - The gradient of stockpiles should not be greater than 1:1.5. • Speed limit will be enforced on the construction vehicles and these vehicles will only make use of designated roads / pathways. • Dust control measures will be implemented if nuisance dust generation occurs during the construction period. • All human movement and activities must be contained within designated construction areas and the planned site access road in order to prevent peripheral impacts on surrounding natural habitat. • Visual inspections should be undertaken regularly to ensure environmental compliance. • Storm water measures will be implemented in order to manage storm water and this will also					

2. LOSS OF SOIL	
	prevent erosion. • Visual inspections for the occurrence of erosion should be undertaken on a weekly basis during the construction phase. • If erosion is evident, proper erosion control measures should be implemented as soon as possible.
Post construction phase and rehabilitation phase	• Erosion should be prevented as far as possible and attended to, as serious erosion may occur at barren areas. • Return and spread topsoil cover (to original depth, or as recommended by the ecological specialist) over rehabilitated area. • Vegetation should be allowed to re-establish naturally over disturbed area to be rehabilitated. • Areas which show no vegetation growth nine months after completion of the rehabilitation work, must be ripped, additional topsoil spread and seeded with indigenous grass species.

3. POLLUTION CONTROL						
Assessment						
Mitigation Status	**Extent**	**Duration**	**Intensity**	**Probability**	**Significance**	**Status**
Without Mitigation	Regional	Permanent	High	Definite	High	Negative
With Mitigation	Local	Long-term	Medium	Definite	Medium	Negative
Recommendation						
Phase	**Description of recommendation**					
General	• Please refer to the Specialist Reports in Appendix D for more recommendations					
Planning Phase	• No environmental mitigation measures is required during the planning phase on the proposed site, as no mitigation measures are to be implemented on site during the planning phase. • However, the engineers, specialists and environmental consultants took various factors into consideration, to be implemented during the construction / operational phase.					
Construction phase and operational phase	• Visual inspections for the occurrence of pollution should be undertaken daily during the operational phase. • Best practices should be implemented in the case of spillages / pollution / erosion. • No waste (general / construction / potential hazardous / etc.) may be dumped in the veld / water features. • Waste classification should be undertaken. • Suitable waste bins etc. will be available on site for the temporary disposal of waste. • Waste will be removed from site and disposed of at an authorised landfill site. • DWS should be notified of any spillage / pollution within 24 hours of occurrence within water resources. • Record should be kept on site to indicate date of visual inspection, any spillages observed, and manner in which spill was treated. • Water to be transported should adhere to the DWS standards. • An emergency plan should be developed in case the water to be disposed of does not					

3. POLLUTION CONTROL	
	conform to the DWS standards. • Visual inspections should be undertaken at least every 6 months to investigate the occurrence of sedimentation and erosion. • Proper erosion mitigation measures should be implemented.
Post construction phase and rehabilitation phase	• Maintenance and repair will be undertaken when necessary. • All temporary infrastructure related to the construction phase will be removed from site. • Temporary concrete surfaces (if any) will be removed and compacted areas ripped. • No waste will be dumped on site and any waste occurring on site will be removed and disposed of according to best practices.

4. LOSS OF ANIMAL LIFE						
Assessment						
Mitigation Status	**Extent**	**Duration**	**Intensity**	**Probability**	**Significance**	**Status**
Without Mitigation	Local	Permanent	Medium	Definite	High	Negative
With Mitigation	Local	Long-term	Medium	Definite	Medium	Neutral
Recommendation						
Phase	**Description of recommendation**					
General	• Please refer to the Specialist Reports in Appendix D for more recommendations					
Planning Phase	• No environmental mitigation measures is required during the planning phase on the proposed site, as no mitigation measures are to be implemented on site during the planning phase. • However, the engineers, specialists and environmental consultants took various factors into consideration, to be implemented during the construction / operational phase.					
Construction phase and operational phase	• No animals may be captured / harmed / killed on site. • Specialists should be appointed to remove / translocate species, if required. The necessary permits should also be obtained. • Any occurrences of harmed animals should be reported to the ECO, the required steps should be taken and should be recorded as such.					
Post construction phase and rehabilitation phase	• No animals may be captured / harmed / killed on site. • Specialists should be appointed to remove / translocate species, if required. The necessary permits should also be obtained. • Any occurrences of harmed animals should be reported to the ECO, the required steps should be taken and should be recorded as such.					

5. Surface Water						
Assessment						
Mitigation Status	**Extent**	**Duration**	**Intensity**	**Probability**	**Significance**	**Status**
Without Mitigation	Regional	Permanent	Medium	Definite	High	Negative
With Mitigation	Local	Long-term	Medium	Definite	Medium	Neutral
Recommendation						
Phase	**Description of recommendation**					
General	• Please refer to the Specialist Reports in Appendix D for more recommendations					
Planning Phase	• No environmental mitigation measures is required during the planning phase on the proposed site, as no mitigation measures are to be implemented on site during the planning phase. • However, the engineers, specialists and environmental consultants took various factors into consideration, to be implemented during the construction / operational phase.					
Construction phase and operational phase	• Storm water measures will be implemented in order to manage storm water and this will also prevent erosion. • Construction activities in waterways should be undertaken in such a manner that no damming of water is required, where possible. 2/3 of the waterways may be diverted at a time, where required should the necessary authorisations be received from DWS. • The necessary authorisations (altering and impeding of beds / banks of water sources) should be obtained from DWS. • Daily inspections for the occurrence of surface water and soil pollution are to be undertaken, during the construction phase. • Best practices should be implemented in the case of spillages / pollution / erosion at the waterways. • Best practices should be implemented to rehabilitate watercourses disturbed due to the construction activities.					
Post construction	• Disturbed waterways (if any) should be rehabilitated according to best practices.					

5. Surface Water	
phase and rehabilitation phase	• All polluted areas should be cleaned as soon as possible. • Waste to be removed from site.

6. VISUAL IMPACT

The visual impact of the proposed development in the landscape is the function of several factors of which the viewing distance, visual absorption capacity and landform are measurable. Other factors are difficult to categorize because they are subjective viewpoints.

The visual impact for the proposed development is largely due to:

- The topography in terms of elevation and aspect;
- The vegetative cover in terms of its extent and height;
- The extent of the proposed development;
- Distance from point of origin; and
- The low visual absorption capacity of the surrounding landscape.

Factors of visual impact

Visual character:

The visual character of an area has different elements that provide an overall perceived ambience. In the consideration of the visual character of a site, it is important to include not only the internal land use but that of the surrounding land as well.

At this site, the visual character is mainly the city of Bloemfontein, agricultural area adjacent to Bloemfontein, the Airport as well as the holdings adjacent to Bloemfontein; all of which are located within viewing distance of the site.

Scale of landscape:

Visual scale is the apparent size relationships between landscape components and their surroundings (Smardon, et al. 1986).

Visual analysis:

In this section the intensity of the visual impact of the development on the surrounding area is described. Aspects such as viewshed, visual absorption capacity and the appearance of the development from critical viewpoints will be used to determine this impact.

The site proposed pipeline and associated infrastructure is situated on the outskirts of the town of Bloemfontein. The pipeline will pass through the Roodewal Small Holdings and join the tarred road at the north eastern border of the small holdings. The pipeline will cross peri-urban, transformed and natural areas. Several watercourses will also be crossed by the pipeline.

Renosterspruit Crossing:

The Renosterspruit contain dense thicket and reed beds. The said spruit is considered to have a PES of Category F: Critically/Extremely modified. Modifications have reached a critical level and the system has been modified completely with an almost complete loss of natural habitat and biota. In the worst instances the basic ecosystem functions have been destroyed and the changes are irreversible. In spite of this seriously modified nature the stream still provide a vital ecosystem service as water conduits and must therefore still be considered sensitive. Several impacts on the stream have caused this modified condition. The stream is naturally only seasonal. However, due to canalisation and runoff from urban areas and industry it can now be seen as a non-natural perennial system. This has had a profound impact on riparian vegetation and the flood dynamics of the stream. The stream flow through urban and industrial areas which contribute highly polluted runoff. This leads to high levels of pollution within the streams. A large portion of the Bloemspruit has been canalised. This has a large impact on the functioning of the stream in terms of flood dynamics and the ecosystem services rendered by an intact riparian community. The Bloemspruit flows past the Bloemfontein WWTW which does not have sufficient capacity and consequently untreated sewage overflows into the stream further leading to high levels of pollution and degradation of the stream. High levels of rubbish dumping takes place within the catchment and in stream and this further degrades these streams. The Bloemspruit feeds into the Renosterspruit and consequently the degraded condition both impact on each other.

Alternative 1$_{\text{RedRoute}}$ & **Alternative 2$_{\text{GreenRoute}}$**

The vegetation along the northern pipeline route has mostly been transformed from the natural condition with only a few remnant patches of natural vegetation remaining and these also not in a good condition. The vegetation along the route is therefore no longer considered to consist of the threatened Bloemfontein Dry Grassland.

Alternative 3$_{\text{BlueRoute}}$

The southern pipeline route alternative contains sections which has been modified and transformed significantly from the natural condition and these portions are consequently of relatively low conservation value. However, several large portions of relatively natural vegetation still remain, especially in the eastern section of the pipeline. Consisting of Bloemfontein Dry Grassland, a Threatened Ecosystem, and highly likely containing protected species, these sections should be regarded as sensitive and

having a significant conservation value. The condition of the vegetation in these sections does however seem to be somewhat degraded along the border fences which should decrease the impact the proposed pipeline will have.

Adequate mitigation will however be required which should include minimising the disturbance footprint and conducting a walkthrough survey to identify and mark protected species along the pipeline route. It is recommended that any protected plant specimens which will be affected by the pipeline construction should be removed and transplanted adjacent to the pipeline in an area of suitable and similar habitat. Permits must be obtained for those specimens to be transplanted.

Site evaluation in terms of visual impact

Visual assessment ratings rates each criterion listed in the table from, high, medium to low according to specific characteristics of those criteria.

Visual assessment criteria used to determine the degree of visual impact of the proposed activities on the environment (adapted from Klapwijk 1998)			
CRITERIA	**HIGH**	**MEDIUM**	**LOW**
Visibility	Very visible from many places beyond 1km	Visible from within 1km zone but partially obscured by intervening objects	Only partially visible within the 1km zone and beyond due to screening by intervening objects
Visual quality	A very attractive setting	A setting with some aesthetic and visual merit	A setting which has little aesthetic merit
Visible man-made structures	Buildings as a dominant visual element	Buildings as a partial visual element	Buildings as a minor visual element
Surrounding landscape compatibility	Cannot accommodate proposed development without appearing totally out of place.	Can accommodate the proposed development without appearing totally out of place	Usually suits or matches the proposed development

Visual assessment criteria used to determine the degree of visual impact of the proposed activities on the environment (adapted from Klapwijk 1998)			
CRITERIA	**HIGH**	**MEDIUM**	**LOW**
Character of site or surrounding area	Exhibits a definite character	Exhibits some character	Little or no character
Contrast between human scale and vertical & horizontal elements in the landscape	There is high contrast	Landscape with some contrast	Limited vertical variation. Most elements are related to human and horizontal scale
Visual absorption capacity (VAC)	Inability of landscape to visually absorb a development because of a limited vegetation cover, flat slope and uniform texture	The lower ability of the landscape to visually absorb the development due to less diverse landform, vegetation & texture	The ability of landscape to easily accept visually a particular development because of its diverse landform, vegetation and texture
View distance (uninterrupted)	More than 5km	Between 5km & 1km	Between 1km & 500m
Critical views	Views of the development are to be seen by many people passing on road routes and from prominent areas	Some views of the development from surrounding routes and housing	Limited views to the development from roads and housing

Results and conclusions on visual impact of development assessment

Aspect	Result
Visibility	HIGH
Visual quality	MEDIUM
Visible man-made structures	MEDIUM
Surrounding landscape compatibility	MEDIUM
Character of site or surrounding area	MEDIUM
Contrast between human scale, vertical & horizontal elements in the landscape	MEDIUM
Visual absorption capacity (VAC)	MEDIUM
View distance (uninterrupted)	MEDIUM
Critical views	MEDIUM

The proposed development will have a medium visual impact. This is largely due to:

- The extent of the development
- The surrounding agricultural as well as residential areas, the locality of the existing airport as well as the current state of the various water resources in the area.

APPENDIX G

Environmental Management Programme (EMPr)

ENVIRONMENTAL MANAGEMENT PROGRAMME

THE PROPOSED CONSTRUCTION OF A SECTION OF A WATER PIPELINE TO CONNECT THE BLOEMSPRUIT WWTW TO MOCKES DAM, BLOEMFONTEIN

Proponent: Mangaung Metropolitan Municipality
MDA Ref No: 40673 2018
Date: April 2020

mda
Town & Regional Planners,
Environmental & Development
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Physical Address: 9 Barnes Street,
Westdene, Bloemfontein, 9301
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1. INTRODUCTION

1.1 Project and associated construction activities

The proposed project entails the proposed construction of a pipeline.

Please refer to the map in Appendix A of the Basic Assessment Report for an indication on the locality of the proposed activities.

1.2 Objectives of the EMPr

The EMPr aims to fulfil the requirements in terms of the National Environmental Management Act (Act 107 of 1998), with the following objectives:

- To identify, predict and evaluate actual and potential impacts on the environment, socio-economic conditions and cultural heritage, the risks and consequences and alternatives and options for mitigation of activities, with a view to minimizing negative impacts, maximizing benefits and promoting compliance with the principles of environmental management;
- To identify and employ the modes of environmental management best suited to ensuring that the activity is pursued in accordance with best environmental management practices;
- To be able to respond to unforeseen events; and
- To provide feedback on compliance.

1.3 Implementation of the EMPr

The proponent, namely Mangaung Metropolitan Municipality is responsible for the implementation of the EMPr. All contractors should be supplied with a copy of the EMPr and should ensure that construction staff adheres to the mitigation measures.

2. PREPARATION OF THE EMPR

2.1 Person(s) who prepared the EMPr

i) Mr Neil Devenish
ii) Me Hanlie Stander

MDA
P.O. Box 100982
Brandhof
Bloemfontein
9324
Tel: 051 447 1583
Fax: 051 448 9839

2.2 Expertise of the person(s) who prepared the EMPr

i) Mr Neil Devenish

Key qualifications:
- Key competencies and experience include development control applications (applications and appeals pertaining to rezoning, consolidations, subdivisions etc.) township establishment applications, environmental management and control applications.

Education:
- B. A. (Sociology, Geography) University of the Free State, SA, 1994
- Master of Town and Regional Planning, University of the Free State, SA, 1996
- Managing the Environmental Impact Assessment Process, Environmental Management Unit, PU for CHE, 2000
- Environmental Management Consulting, South African Institute of Ecologists & Environmental Scientists, 2001
- Water Law of South Africa, The South African Institution of Civil Engineers (SAICE), 2006

ii) Me Hanlie Stander

Key qualifications:
- Key competencies and experience include environmental management and research in zoology and environmental management.

Education:
- B.Sc. (Zoology), University of the Free State, South Africa, 2005
- B.Sc. Honors (Zoology), University of the Free State, South Africa, 2006
- M.Sc. (Zoology), University of the Free State, South Africa, 2012

3. RECOMMENDED MANAGEMENT AND MITIGATION MEASURES

ECO - Environmental Control Officer / IECO - Independent Environmental Control Officer / SO - Safety Officer

Compliance and Monitoring					
Objective	**Mitigation Measure**	**Executing Party**	**Monitoring Party**	**Timeframe**	**Project Stage**
Record keeping of compliance and monitoring reports	1. The applicant will ensure that the contractors adhere to the recommendations of the EMPr and conditions of the Environmental Authorisation during construction.	Applicant / Contractor	Contractor / ECO / Applicant	On-going	Planning, Construction & Rehabilitation
	2. An Environmental Control Officer (ECO) will be appointed to monitor the construction phase. Note that the ECO may be appointed separately or can be part of the contractor's team.	ECO / Contractor	IECO	On-going	Construction & Rehabilitation
	3. Regular monitoring and / or spot inspections at least every fortnight during the construction phase is recommended.	ECO / Contractor	ECO/ IECO	On-going	Construction & Rehabilitation
	4. Inspections should be documented and any shortcomings addressed immediately.	ECO / Contractor	ECO/ IECO	On-going	At all phases
	5. A report will be provided by the independent ECO to the contractor upon completion thereof. The findings thereof should be made available to the competent authority (for example DESTEA, DWS), should it be requested.	IECO / Contractor	ECO/ DESTEA / DWS	On-going	At all phases

Compliance and Monitoring					
Objective	**Mitigation Measure**	**Executing Party**	**Monitoring Party**	**Timeframe**	**Project Stage**
	6. Any emergency or unforeseen impact will be reported to the relevant environmental department / DWS within 24 hours after identification for telephonic approval and will be confirmed in writing.	ECO / Contractor	ECO/ IECO / DWS / DESTEA	On-going	At all phases
	7. During the operational phase the pipeline and associated infrastructure must be routinely audited and maintenance schedule adjusted accordingly in order to prevent leakage.	Applicant	DWS / DESTEA	On-going	Operational
	8. Material Safety Data Sheets (MSDS) should be available on site. Where possible and available, MSDS should include information on ecological impacts and measures to minimize negative environmental impacts during accidental releases or escapes.	ECO / Contractor	ECO/ IECO / DWS / DESTEA	On-going	Construction & Rehabilitation
	9. Procedures in the MSDS should be implemented in case of an emergency	ECO / Contractor	ECO/ IECO / DWS / DESTEA	On-going	Construction & Rehabilitation
	10. The following documents should be available on site, and made available to the competent authority on request (if applicable): - Complaints Register - Environmental Incident Register - Disposal Certificates of waste	ECO / Contractor	ECO/ IECO / DWS / DESTEA	On-going	Construction & Rehabilitation

Compliance and Monitoring					
Objective	**Mitigation Measure**	**Executing Party**	**Monitoring Party**	**Timeframe**	**Project Stage**
	generated - during the construction / operational phase - Disposal Certificates of waste generated as a result of the construction activities. - Environmental Monitoring (Audit) Reports - Written Corrective Action Instructions - Environmental Authorisation - DWS Permit / License - Blasting Permit - EMPr				

Planning and Design Phase					
Objective	**Mitigation Measure**	**Executing Party**	**Monitoring Party**	**Timeframe**	**Project Stage**
Planning and design NOTE: Should the following aspects not be taken into consideration during the Planning and Design Phase, the environmental impacts associated with the construction and operation phase will be of high significance as the environment	1. No environmental mitigation measures are required during the planning phase on the proposed site, as no mitigation measures are to be implemented on site during the planning phase.	Applicant / Engineers / Environmental Consultant / Contractor	Applicant	On-going	Planning & Design
	2. The design and layout of the proposed project will take the possibility of flooding, erosion and pollution into consideration	Applicant / Engineers / Environmental Consultant / Contractor	Applicant	On-going	Planning & Design
	3. The applicant, engineers, environmental consultants and specialists should take the following steps during the planning phase: - Permits will be obtained for the removal / transplantation of protected species (if any) that are located within the construction area where no alternatives are possible. - A monitoring system should be implemented to determine the occurrence (if any) of any fuel / oil spillages during the construction phase.	Applicant / Engineers / Environmental Consultant / Contractor	Applicant	On-going	Planning & Design

Planning and Design Phase					
Objective	**Mitigation Measure**	**Executing Party**	**Monitoring Party**	**Timeframe**	**Project Stage**
will be negatively affected.	- The necessary Environmental Authorisation will be obtained before any activities listed in the Regulations are undertaken. - In addition, the necessary DWS registrations will be obtained, before any construction activities near watercourses are undertaken. - The necessary precautions with regard to road safety will be implemented for construction work to be undertaken within road crossings (if any). - Proper sanitation, potable water and waste facilities will be in place before construction activities are undertaken. - A blasting permit will be obtained before blasting activities is undertaken (if any).				

Construction Phase					
Objective	**Mitigation Measure**	**Executing Party**	**Monitoring Party**	**Timeframe**	**Project Stage**
General measures to consider	1. Any construction is disruptive and the environment must be given consideration with every activity undertaken	Contractor	ECO / IECO	On-going	Construction
	2. All relevant standards relating to legislation should be adhered to (including waste emissions, waste disposal, noise regulations, etc.)	Contractor	ECO / IECO	On-going	Construction
	3. According to Section 28 of the NEMA Act 107, every person who cause, has caused or may cause significant pollution or degradation of the environment must take reasonable measures to prevent such pollution or degradation from occurring, continuing or recurring and if it can't be avoided or stopped, to minimize and rectify such pollution or degradation of the environment.	Contractor	ECO / IECO	On-going	Construction
	4. The pollution control provision in Section 19(1) of the National Water Act (Act 36 of 1998) should be adhered to at all times.	Contractor	ECO / IECO	On-going	Construction

Construction Phase					
Objective	**Mitigation Measure**	**Executing Party**	**Monitoring Party**	**Timeframe**	**Project Stage**
	5. ECO should be provided with a layout of the site, indicating the position of the following prior to the site establishment, for acceptance: - Ablution Facilities - Storage Areas - Ready-mix Areas - Stockpile Areas - Waste Disposal Facilities - Hazardous Substances Storage Area - Etc.	Contractor / ECO	ECO / IECO	On-going	Construction
	6. Designate the boundaries of the active construction start-up site, by erecting fencing / danger tape (where applicable)	Contractor	ECO / IECO	On-going	Construction
	7. Fence off operational footprint area (if possible) to ensure all operational activities are contained within the designate area.	Contractor	ECO / IECO	On-going	Construction
	8. All construction and operational activities must be contained within the demarcated servitude determined in consultation with the ECO.	Contractor / ECO	ECO / IECO	On-going	Construction
	9. Care will be taken to prevent unnecessary damage to vegetation near to construction activities.	Contractor	ECO / IECO	On-going	Construction

Construction Phase					
Objective	**Mitigation Measure**	**Executing Party**	**Monitoring Party**	**Timeframe**	**Project Stage**
	10. The necessary precautions with regard to road safety will be implemented for construction work within road crossings (if any).	Contractor	ECO / IECO	On-going	Construction
	11. Proper sanitation, water and waste facilities will be in place for construction workers throughout the construction phase.	Contractor	ECO / IECO	On-going	Construction
	12. Chemical toilets will be cleaned and serviced regularly and proof thereof will be available on site.	Contractor	ECO / IECO	On-going	Construction
	13. Potable water will be made available daily to workers on site.	Contractor	ECO / IECO	On-going	Construction
	14. Fire-fighting equipment will be available on site, where applicable.	Contractor	ECO / IECO	On-going	Construction
	15. If artefacts or graves are uncovered during construction activities, work in the immediate vicinity will be stopped until the project Archaeologist and SAHRA has been consulted.	Contractor	ECO / IECO	On-going	Construction
	16. Adjacent landowners will be notified of proposed blasting, 24 hours prior to blasting activities.	Contractor	ECO / IECO	On-going	Construction

Construction Phase					
Objective	**Mitigation Measure**	**Executing Party**	**Monitoring Party**	**Timeframe**	**Project Stage**
Site access	1. Necessary drawings for the upgrading of intersections (if any) are to be submitted to the relevant authority (SANRAL / Provincial Department of Roads / Municipality's Department of Roads) for approval, and the upgrades are to be implemented	Applicant / Contractor	ECO / IECO	On-going	Construction
	2. The current access road should be improved, when required	Contractor	ECO / IECO	On-going	Construction
	3. Proper storm water measures are to be implemented to avoid run-off of water and washing of sand / soil onto the road	Contractor	ECO / IECO	On-going	Construction
	4. Erosion measures will be implemented	Contractor	ECO / IECO	On-going	Construction
	5. Removal of vegetation will be kept to the required area	Contractor	ECO / IECO	On-going	Construction
	6. No animals will be hunted / captured on site (only to be undertaken by a relevant specialist)	Contractor / ECO	ECO / IECO	On-going	Construction
Employee conduct on site	1. No animals may be harmed / captured / trapped and / or hunted. This must be strictly enforced.	Contractor / ECO	ECO / IECO	On-going	Construction

Construction Phase					
Objective	**Mitigation Measure**	**Executing Party**	**Monitoring Party**	**Timeframe**	**Project Stage**
	2. Animals found at the construction site will be removed and relocated to an appropriate area, by a suitable, qualified person	Contractor / ECO	ECO / IECO	On-going	Construction
	3. No open fires allowed. Provision will be made that no accidental fires are started.	Contractor / ECO	ECO / IECO	On-going	Construction
	4. No firewood will be collected on site or in surrounding areas, without written approval from the landowner.	Contractor / ECO	ECO / IECO	On-going	Construction
	5. No smoking or open fires will be allowed near storage facilities	Contractor / ECO	ECO / IECO	On-going	Construction
	6. No waste may be dumped on site	Contractor / ECO	ECO / IECO	On-going	Construction
	7. Employees should make use of the ablution facilities provided	Contractor / ECO	ECO / IECO	On-going	Construction
Soil, erosion and vegetation management	1. Construction activities will be limited to designated construction areas to prevent peripheral impacts on surrounding natural habitats. Construction vehicles will also keep to constructed roads where possible, so that natural vegetation is not destroyed unnecessarily.	Contractor / ECO	ECO / IECO	On-going	Construction

Construction Phase					
Objective	**Mitigation Measure**	**Executing Party**	**Monitoring Party**	**Timeframe**	**Project Stage**
	2. Access roads or temporary crossings must be non-erosive, structurally stable and not induce flooding / safety hazard.	Contractor / ECO	ECO / IECO	On-going	Construction
	3. If any access road or temporary crossing is impaired, it will be repaired immediately to prevent any future / further damage.	Contractor / ECO	ECO / IECO	On-going	Construction
	4. All human movement and activities will be contained within designated construction areas in order to prevent peripheral impacts on surrounding natural habitat.	Contractor / ECO	ECO / IECO	On-going	Construction
	5. Erosion management is important. Rehabilitation measures must be monitored to ensure that no erosion has occurred and the disturbed areas have been adequately re-vegetated.	Contractor / ECO	ECO / IECO	On-going	Construction
	6. Concurrent rehabilitation of disturbed areas will be undertaken to help the recovery of the vegetation.	Contractor / ECO	ECO / IECO	On-going	Construction
	7. Stockpiled soil will be stockpiled in an area where it will not be disturbed by vehicles.	Contractor / ECO	ECO / IECO	On-going	Construction

Construction Phase					
Objective	**Mitigation Measure**	**Executing Party**	**Monitoring Party**	**Timeframe**	**Project Stage**
	8. Stockpiled soil will be protected from washing away during rainstorms. For example: - Bricks may be placed around the stockpiles, to limit the loss thereof due to rainy events. - Stockpiles should not be higher than 1.5 m. - The gradient of stockpiles should not be greater than 1:1.5.	Contractor / ECO	ECO / IECO	On-going	Construction
	9. Stockpiles should be located away from drainage lines, watercourses and areas of temporary flood	Contractor / ECO	ECO / IECO	On-going	Construction
	10. All soil excavated is to be separated into top- and subsoil. Subsoil must be used for backfilling and topsoil for landscaping and rehabilitation of disturbed areas	Contractor / ECO	ECO / IECO	On-going	Construction
	11. Stockpiled material will be placed on the cleared areas once construction is completed. Re-spreading of topsoil is preferably to be done to the natural level.	Contractor / ECO	ECO / IECO	On-going	Construction
	12. Fertilisers should be used where topsoil and subsoil was mixed or where the topsoil is not up to original standard	Contractor / ECO	ECO / IECO	On-going	Construction

Construction Phase					
Objective	**Mitigation Measure**	**Executing Party**	**Monitoring Party**	**Timeframe**	**Project Stage**
	13. Indigenous tree species in the vicinity of the operational site (if any) should be marked with danger tape. Disturbance to such species should be avoided, where possible.	Contractor / ECO	ECO / IECO	On-going	Construction
	14. A permit for the removal of protected plant species will be obtained before the removal of these species (if any).	Applicant / Contractor	ECO / IECO	On-going	Construction
	15. An alien control and monitoring programme will be developed starting during the construction phase and will be carried over into the operational phase.	Contractor / ECO	ECO / IECO	On-going	Construction
	16. Any proclaimed weed or alien species that germinates during the contract period will be cleared by hand / approved chemicals before flowering thereof.	Contractor / ECO	ECO / IECO	On-going	Construction
	17. Imported fill material will be monitored during and after construction for the presence of any alien species. Any such species will be removed immediately.	Contractor / ECO	ECO / IECO	On-going	Construction
	18. Fire fighting equipment will be available on site.	Contractor / ECO	ECO / IECO	On-going	Construction

Construction Phase					
Objective	**Mitigation Measure**	**Executing Party**	**Monitoring Party**	**Timeframe**	**Project Stage**
	19. Species, especially grasses, trees and shrubs occurring in the region will be used to rehabilitate disturbed areas.	Contractor / ECO	ECO / IECO	On-going	Construction
	20. Compacted soils (such as dirt tracks not to be utilised during the operational phase) must be ripped to ensure the establishment of natural occurring vegetation.	Contractor / ECO	ECO / IECO	On-going	Construction
	21. Should natural re-growth not be sufficient, the area should be hydro-seeded.	Contractor / ECO	ECO / IECO	On-going	Construction
	22. Concurrent rehabilitation should be undertaken, where possible.	Contractor / ECO	ECO / IECO	On-going	Construction
	23. Vegetation clearance will be limited to the required area.	Contractor / ECO	ECO / IECO	On-going	Construction
	24. Speed limit will be enforced on the construction vehicles and these vehicles will only make use of designated roads / pathways.	Contractor / ECO	ECO / IECO	On-going	Construction
	25. Dust control measures will be implemented if nuisance dust generation occurs during the construction period.	Contractor / ECO	ECO / IECO	On-going	Construction

Construction Phase					
Objective	**Mitigation Measure**	**Executing Party**	**Monitoring Party**	**Timeframe**	**Project Stage**
	26. All archaeological findings (if any) should be recorded and reported to SAHRA. No construction activities in the area may proceed without the authorisation from SAHRA.	Contractor / ECO	ECO / IECO	On-going	Construction
	27. Storm water measures will be implemented in order to manage storm water and this will also prevent erosion.	Contractor / ECO	ECO / IECO	On-going	Construction
	28. Visual inspections for the occurrence of erosion should be undertaken on a weekly basis.	Contractor / ECO	ECO / IECO	On-going	Construction
	29. No animals may be captured / harmed / killed on site.	Contractor / ECO	ECO / IECO	On-going	Construction
	30. Any occurrences of harmed animals should be reported to the ECO and recorded as such.	Contractor / ECO	ECO / IECO	On-going	Construction
Minimise contamination and sterilisation of soil	1. Use of potentially polluting and hazardous substances should be strictly controlled	Contractor / ECO	ECO / IECO	On-going	Construction
	2. If soil is significantly contaminated by hazardous substances, then this soil is considered as hazardous and should be disposed of according to best practices	Contractor / ECO	ECO / IECO	On-going	Construction

Construction Phase					
Objective	**Mitigation Measure**	**Executing Party**	**Monitoring Party**	**Timeframe**	**Project Stage**
	3. Minor vehicle repair / maintenance will be conducted on site, and impacts like oil spills should be appropriately mitigated. Spill response procedures must be clearly defined and well known by all staff.	Contractor / ECO	ECO / IECO	On-going	Construction
	4. All threatened or protected plant species as specified by the NEM: Biodiversity Act (2004) will be identified on site. Permits are required for the removal / transplantation of these plants.	Contractor / ECO	ECO / IECO	On-going	Construction
Trenching, placing of pipeline and covering of pipeline	1. Site will be kept neat and tidy.	Contractor / ECO	ECO / IECO	On-going	Construction
	2. Appropriate area will be identified as a stockpiling area.	Contractor / ECO	ECO / IECO	On-going	Construction
	3. Speed limit will be enforced on the construction vehicles and these vehicles will only make use of designated roads / pathways.	Contractor / ECO	ECO / IECO	On-going	Construction
	4. Dust control measures will be implemented if nuisance dust generation occurs during the construction period.	Contractor / ECO	ECO / IECO	On-going	Construction

Construction Phase					
Objective	**Mitigation Measure**	**Executing Party**	**Monitoring Party**	**Timeframe**	**Project Stage**
	5. Stockpiled material will be stored in such a way to limit the loss thereof. For example: - Bricks may be placed around the stockpiles, to limit the loss thereof due to rainy events. - Stockpiles should not be higher than 1.5 m. - The gradient of stockpiles should not be greater than 1:1.5.	Contractor / ECO	ECO / IECO	On-going	Construction
	6. Noise control measures will be implemented.	Contractor	ECO / IECO	On-going	Construction
	7. All employees will be provided with the correct PPE.	Contractor	ECO / IECO	On-going	Construction
	8. Establishment of alien / invader vegetation will be monitored and these species will be removed by hand or by an approved chemical before gestation thereof.	Contractor / ECO	ECO / IECO	On-going	Construction
	9. All archaeological findings (if any) should be recorded and reported to SAHRA. No construction activities in the area may proceed without the authorisation from SAHRA.	Contractor / ECO	ECO / IECO	On-going	Construction

Construction Phase					
Objective	**Mitigation Measure**	**Executing Party**	**Monitoring Party**	**Timeframe**	**Project Stage**
	10. Storm water measures will be implemented in order to manage storm water and this will also prevent erosion.	Contractor / ECO	ECO / IECO	On-going	Construction
	11. Visual inspections for the occurrence of erosion should be undertaken on a weekly basis.	Contractor / ECO	ECO / IECO	On-going	Construction
	12. No animals may be captured / harmed / killed on site.	Contractor	ECO / IECO	On-going	Construction
	13. Any occurrences of harmed animals should be reported to the ECO and recorded as such.	Contractor	ECO / IECO	On-going	Construction
Ablution Facilities	1. No open areas or the surrounding vegetation may be used as 'toilet facilities'.	Contractor	ECO / IECO	On-going	Construction
	2. Toilets should be available for all employees. Where waterborne sewerage is not available, the ECO must designate an area within the boundaries of the site for the erection of portable chemical toilets.	Contractor / ECO	ECO / IECO	On-going	Construction
	3. Toilet facilities shall occur at a minimum ration of 1 toilet per 15 employees.	Contractor / ECO	ECO / IECO	On-going	Construction
	4. Toilets shall be maintained in a hygienic state and serviced when required.	Contractor / ECO	ECO / IECO	On-going	Construction

Construction Phase					
Objective	**Mitigation Measure**	**Executing Party**	**Monitoring Party**	**Timeframe**	**Project Stage**
	5. Temporary toilets should be serviced regularly and the contents be removed to a licensed disposal facility.	Contractor / ECO	ECO / IECO	On-going	Construction
Safeguard water resources	1. No activities will be undertaken within 32 m of a watercourse / within the 1:100 year floodline / 500m of a wetland, without the necessary authorisations (for example from DESTEA and DWS).	Contractor / ECO	IECO / DWS / DESTEA	On-going	Construction
	2. Caution will be taken to ensure that construction materials are not dumped or stored within storm water management systems.	Contractor / ECO	IECO / DWS / DESTEA	On-going	Construction
	3. Construction activities in the storm water infrastructure will be limited through proper demarcation and appropriate environmental awareness training.	Contractor / ECO	ECO / IECO	On-going	Construction
	4. The Contractor is responsible to inform all staff of the need to be vigilant against any practice that will have a harmful effect on waterways.	Contractor	ECO / IECO	On-going	Construction
	5. Infilling, excavation, drainage and hardening of surfaces will not occur unnecessarily in storm water infrastructure.	Contractor	ECO / IECO	On-going	Construction
	6. Emergency plans will be in place in case of fuel spillages (to limit the occurrence of soil as well as groundwater pollution).	Contractor	ECO / IECO	On-going	Construction

Construction Phase					
Objective	**Mitigation Measure**	**Executing Party**	**Monitoring Party**	**Timeframe**	**Project Stage**
	7. A monitoring system should be implemented to determine the occurrence (if any) of any fuel / oil spillages during the construction phase.	Contractor	ECO / IECO	On-going	Construction
	8. The necessary mitigation measures should be implemented immediately, should any leakages / spills be detected.	Contractor	ECO / IECO	On-going	Construction
	9. Weather forecasts from the South African Weather Bureau of up to three days in advance will be monitored on a daily basis to avoid exposing soil or construction works or materials during a storm event and appropriate action will be taken in advance to protect construction works should a storm event be forecasted.	Contractor	ECO / IECO	On-going	Construction
	10. All no-go areas will be demarcated under guidance of the Environmental Control Officer (ECO).	Contractor / ECO	ECO / IECO	On-going	Construction
	11. The design of drainage systems will ensure that there is no contamination or eutrophication. Drainage systems will be maintained regularly in order to minimize the runoff of harmful chemical substances into the waterway(s).	Contractor	ECO / IECO	On-going	Construction

Construction Phase					
Objective	**Mitigation Measure**	**Executing Party**	**Monitoring Party**	**Timeframe**	**Project Stage**
	12. It will be ensured that the construction activities have minimal effects on the flow of water through the storm water infrastructure.	Contractor	ECO / IECO	On-going	Construction
	13. No erosion or siltation may occur due to any construction or operational activities.	Contractor	ECO / IECO	On-going	Construction
	14. Construction and operational activities should take the wetland boundaries and associated buffer zones into consideration (if any).	Contractor	ECO / IECO	On-going	Construction
	15. Occurrence of erosion will be monitored. Reparations will be undertaken as soon as possible.	Contractor	ECO / IECO	On-going	Construction
Workings within / near to watercourses	1. Storm water measures will be implemented in order to manage storm water and this will also prevent erosion.	Contractor	ECO / IECO	On-going	Construction
	2. Construction activities in waterways should be undertaken in such a manner that no containment of water is required, where possible. 2/3 of the waterways may be diverted at a time, where required.	Contractor	ECO / IECO	On-going	Construction
	3. The necessary authorisations should be obtained from DWS, should the containment of water be required.	Contractor	ECO / IECO / DWS	On-going	Construction

Construction Phase					
Objective	**Mitigation Measure**	**Executing Party**	**Monitoring Party**	**Timeframe**	**Project Stage**
	4. All scour outlets will be provided with stone pitched and / or gabion mattress lined channels.	Contractor	ECO / IECO	On-going	Construction
	5. Visual inspections for the occurrence of erosion should be undertaken on a weekly basis.	Contractor / ECO	ECO / IECO	On-going	Construction
Handling of waste / Waste Management (Note that waste refers to all construction debris and domestic waste generated due to construction activities.)	1. The contractor is responsible for the removal of construction waste.	Contractor	ECO / IECO	On-going	Construction
	2. Suitable containers (weather and vermin proof) will be placed on site to collect all solid waste. These will be emptied regularly.	Contractor	ECO / IECO	On-going	Construction
	3. No littering is permitted. During the construction and operational phase the site will be maintained in a neat and tidy condition.	Contractor	ECO / IECO	On-going	Construction
	4. All solid waste produced will be disposed of at an authorized landfill site. Recyclable waste may also be sold to recycling contractors.	Contractor	ECO / IECO	On-going	Construction
	5. No dumping, burning or burying of waste will be undertaken on site.	Contractor	ECO / IECO	On-going	Construction

Construction Phase					
Objective	**Mitigation Measure**	**Executing Party**	**Monitoring Party**	**Timeframe**	**Project Stage**
	6. All hazardous waste will be disposed of at an authorized hazardous landfill site. Recyclable hazardous waste may be re-used or sold to recycling contractors, where possible.	Contractor	ECO / IECO	On-going	Construction
	7. A waste management plan will be compiled and designed to ensure that adequate waste management activities are undertaken.	Contractor	ECO / IECO	On-going	Construction
	8. Areas used for waste storage and loading of materials should be lined and bund walls have to be erected to contain any spills that might occur.	Contractor	ECO / IECO	On-going	Construction
	9. Waybills providing evidence of correct disposal procedure must be provided for the ECO's inspection.	Contractor	ECO / IECO	On-going	Construction
	10. Waste classification should be undertaken.	Contractor	ECO / IECO	On-going	Construction
	11. Visual inspections for the occurrence of pollution should be undertaken daily.	Contractor	ECO / IECO	On-going	Construction
	12. Spills should be cleaned up immediately according to best practices	Contractor	ECO / IECO	On-going	Construction

Construction Phase					
Objective	**Mitigation Measure**	**Executing Party**	**Monitoring Party**	**Timeframe**	**Project Stage**
	13. DWS should be notified of any spillage / pollution of water sources (groundwater and / or surface water) within 24 hours of occurrence	Contractor	ECO / IECO / DWS	On-going	Construction
	14. Record should be kept on site to indicate date of visual inspection, any spillages observed, and manner in which spill was treated.	Contractor / ECO	ECO / IECO / DWS	On-going	Construction
Health, safety and security	1. Site should be fenced / marked with danger tape, where possible.	Contractor	ECO / IECO	On-going	Construction
	2. The contractors will comply with the Occupational Health and Safety Act, National Building Regulations and any other national, regional or local regulations with regard to safety on site.	Contractor	ECO / IECO	On-going	Construction
	3. Construction contracts will include safety and security measures for staff.	Contractor	ECO / IECO	On-going	Construction
	4. Precautions to ensure that construction staff and sites are visible and proper PPE will be provided to all employees.	Contractor	ECO / IECO	On-going	Construction
	5. Suitable warning and information signage should be available at the storage facilities. In addition, telephone numbers of emergency services (including local firefighting services)	Contractor	ECO / IECO	On-going	Construction

Construction Phase					
Objective	**Mitigation Measure**	**Executing Party**	**Monitoring Party**	**Timeframe**	**Project Stage**
	must be posted conspicuously on site.				
	6. Employees should be made aware of the health risks associated with any hazardous substances / dangerous goods used or stored on site. This includes soil that was contaminated with oil or diesel, etc.	Contractor	ECO / IECO	On-going	Construction
	7. Employees should receive relevant safety training in handling of hazardous substances / dangerous goods associated with the proposed project.	Contractor	ECO / IECO	On-going	Construction
	8. Construction work within road reserves will accommodate road users as far as possible. This includes the following: - Roads will be crossed in half widths at a time to minimise the impact on vehicular traffic, where possible. - Construction along and across existing roads will be executed in such a manner that both pedestrian and vehicular traffic is accommodated at all times. - The contractor will be required to maintain adequate access to all public	Contractor	ECO / IECO	On-going	Construction

Construction Phase					
Objective	**Mitigation Measure**	**Executing Party**	**Monitoring Party**	**Timeframe**	**Project Stage**
	and private property at all times. - Contractor will supply, erect and maintain road signs for all work areas conforming to the prescribed layout and requirement of the South African Road Traffic Signs Manual and other relevant notices.				
	9. Fire extinguishers will be available on site and in the construction camp (if any).	Contractor	ECO / IECO	On-going	Construction
	10. The contractor will be required to maintain adequate access to all public and private property at all times.	Contractor	ECO / IECO	On-going	Construction
	11. Speed limits of 20km/h will be enforced.	Contractor	ECO / IECO	On-going	Construction
	12. All relevant IAPs will be notified prior to any blasting activities	Contractor	ECO / IECO	On-going	Construction
	13. All relevant IAPs will be notified 24 hours prior to any known potential risks associated with the site and the activities to be undertaken on site (for example, possible downstream flooding as a result of removal of upstream diversion).	Contractor	ECO / IECO	On-going	Construction

Construction Phase					
Objective	**Mitigation Measure**	**Executing Party**	**Monitoring Party**	**Timeframe**	**Project Stage**
	14. The necessary precautions with regard to road safety will be implemented for construction work within road crossings.	Contractor	ECO / IECO	On-going	Construction
	15. All injuries should be recorded.	Contractor	ECO / IECO	On-going	Construction
Heritage	1. In the case of the discovery of any heritage, archaeological or palaeontological significance, the work in the area will be stopped and reported to the archaeologist and SAHRA. Any construction activities in the nearby vicinity may only commence after approval is obtained from SAHRA as well as the ECO.	Contractor	ECO / IECO / SAHRA	On-going	Construction

Construction Phase					
Objective	**Mitigation Measure**	**Executing Party**	**Monitoring Party**	**Timeframe**	**Project Stage**
	2. In the event of excavations that exceed 1m depth, the newly uncovered sedimentary strata must be monitored by professional palaeontologist during the excavation phase. Should any objects of archaeological or palaeontological remains be found during construction activities, work must immediately stop in that area and the Environmental Control Officer (ECO) must be informed. The ECO must inform the South African Heritage Recourse Agency (SAHRA) and contact an archaeologist and/or palaeontologist, depending on the nature of the find, to assess the importance and rescue them if necessary (with the relevant SAHRA permit). No work may be resumed in this area without the permission from the ECO and SAHRA. If the newly discovered heritage resource is considered significant a Phase 2 assessment may be required. A permit from the responsible heritage authority will be needed.	Contractor / Archaeological or Palaentological Specialist	ECO / IECO / SAHRA	On-going	Construction

Construction Phase					
Objective	**Mitigation Measure**	**Executing Party**	**Monitoring Party**	**Timeframe**	**Project Stage**
	3. Known heritage resources (if any) must be avoided as far as possible.	Contractor	ECO / IECO / SAHRA	On-going	Construction
	4. Employees should be encouraged and informed of the need to be on the look-out for potential fossils / buried archaeological material.	Contractor	ECO / IECO / SAHRA	On-going	Construction
	5. In the case of the discovery of any stone tools or other archaeological or palaentological material, the work in the immediate vicinity should temporarily cease and reported to the archaeologist and SAHRA. Should any human remains be exposed, the archaeologist as well as the local SAPS should be notified.	Applicant / Contractor	ECO / IECO / SAHRA	On-going	Construction
	6. If any evidence of archaeological sites or remains (e.g. remnants of stone-made structures, indigenous ceramics, bones, stone artefacts, ostrich eggshell fragments, charcoal and ash concentrations), fossils or other categories of heritage resources are found during the proposed development, SAHRA APM Unit (Tel: 021 462 5402) must be alerted. If unmarked human burials are uncovered, the	Applicant / Contractor	ECO / IECO / SAHRA	On-going	Construction

Construction Phase					
Objective	**Mitigation Measure**	**Executing Party**	**Monitoring Party**	**Timeframe**	**Project Stage**
	SAHRA Burial Grounds and Graves (BGG) Unit (Tel: 012 320 8490), must be alerted immediately. A professional archaeologist or palaeontologist, depending on the nature of the finds, must be contracted as soon as possible to inspect the findings. If the newly discovered heritage resources prove to be of archaeological or palaeontological significance, a Phase 2 rescue operation may be required subject to permits issued by SAHRA.				
	7. Appropriate measures should be undertaken by the ECO until the archaeologist / SAPS visits the site. This should include the following: - Site should be fenced with 'danger tape' - Position of finding should be recorded - Depth of finding should be recorded - Digital image of the finding should be taken - No information on the findings may be made public without the consent of the archaeologist / SAPS.	Applicant / Contractor	ECO / IECO / SAHRA	On-going	Construction

Construction Phase					
Objective	**Mitigation Measure**	**Executing Party**	**Monitoring Party**	**Timeframe**	**Project Stage**
	8. Construction activities in the area may only continue after approval from the archaeologist and SAHRA.	Applicant / Contractor / ECO	ECO / IECO / SAHRA	On-going	Construction
Noise and dust control	1. Construction activities will be limited to normal daytime hours, where possible	Contractor	ECO / IECO	On-going	Construction
	2. Noise levels will be kept as low as possible during the construction phase in order not to disturb adjacent landowners	Contractor	ECO / IECO	On-going	Construction
	3. Proper mitigation measures will be implemented to limit noise (e.g. the installation of silencers, where required).	Contractor	ECO / IECO	On-going	Construction
	4. Proper mitigation measures will be implemented to limit the formation of dust (e.g. wetting of construction area, when required).	Contractor	ECO / IECO	On-going	Construction

Construction Phase					
Objective	**Mitigation Measure**	**Executing Party**	**Monitoring Party**	**Timeframe**	**Project Stage**
	5. The speed of the construction vehicles will be limited to avoid dangerous conditions, the formation of dust and the excessive deterioration of roads being used.	Contractor	ECO / IECO	On-going	Construction
Handling and Storage of materials	1. All chemicals used during the development, including fuel, will be stored in a proper storeroom or protected area to prevent pollution.	Contractor	ECO / IECO	On-going	Construction
	2. Vehicles will be serviced at designated areas. No oil, diesel or other chemicals may be spilled or discharged anywhere.	Contractor	ECO / IECO	On-going	Construction
	3. Where applicable, the contractors will ensure that all relevant national, regional and local legislation regarding storage, transport, use and disposal of petroleum, chemical, harmful or hazardous substances and materials are adhered to, where necessary.	Contractor	ECO / IECO	On-going	Construction
	4. Cement and concrete mixing, if applicable, will only take place within the construction site. No concrete will be mixed directly on the ground.	Contractor	ECO / IECO	On-going	Construction

Construction Phase					
Objective	**Mitigation Measure**	**Executing Party**	**Monitoring Party**	**Timeframe**	**Project Stage**
	5. All environmental problems occurring on the site such as chemical spillage, wasteful water disposal, etc. will be reported to the ECO. The ECO should implement best practices to rectify the impacts thereof on the environment.	Contractor	ECO / IECO	On-going	Construction
	6. Spill response equipment must be available during the handling and loading of hazardous waste (if any).	Contractor	ECO / IECO	On-going	Construction
	7. Hazardous substances are to be stored in bunded areas.	Contractor	ECO / IECO	On-going	Construction
	8. Bund walls will have a capacity of at least 110% of the total capacity of the stored volume.	Contractor	ECO / IECO	On-going	Construction
	9. No oil, diesel or other chemicals may be spilled or discharged anywhere and contact with bare soil should be avoided at all cost.	Contractor	ECO / IECO	On-going	Construction
	10. Drip trays will be used during the servicing of vehicles as well as the transfer of chemicals / substances from transportation vehicles.	Contractor	ECO / IECO	On-going	Construction
	11. A monitoring system should be implemented to determine the occurrence (if any) of any fuel / oil spillages / untreated sewer.	Contractor	ECO / IECO	On-going	Construction

Construction Phase					
Objective	**Mitigation Measure**	**Executing Party**	**Monitoring Party**	**Timeframe**	**Project Stage**
	12. The necessary mitigation measures should be implemented immediately, should any leakages / spills be detected.	Contractor	ECO / IECO	On-going	Construction
	13. Material stockpiles, such as bricks and pipes, must be stable and well secured to avoid collapse and possible injury	Contractor	ECO / IECO	On-going	Construction
	14. Material and Safety Data Sheets (MSDSs) should be readily available on site for all hazardous materials. MSDSs should additionally include information on ecological impacts and measures to minimise negative environmental impacts during accidental releases or escapes.	Contractor	ECO / IECO	On-going	Construction
	15. Storage areas should be kept clean and free from any accumulation of combustible matter (such as paper) and any possible source of ignition should be removed.	Contractor	ECO / IECO	On-going	Construction
Hazardous waste management	1. Hazardous wastes must be separated from general wastes, stored within secondary containment in appropriate containers.	Contractor	ECO / IECO	On-going	Construction

Construction Phase					
Objective	**Mitigation Measure**	**Executing Party**	**Monitoring Party**	**Timeframe**	**Project Stage**
	2. Proper storage facilities for the storage of hazardous / dangerous goods must be provided to prevent the migration of spillage into the soil and or groundwater.	Contractor	ECO / IECO	On-going	Construction
	3. Certificates / waybills of hazardous waste disposals are to be available on request as well as auditing purposes. This includes the removal of soil contaminated with hydrocarbons.	Contractor	ECO / IECO	On-going	Construction
	4. Storage of hazardous substances and refuelling areas are to be bunded with an impermeable liner to protect groundwater quality and must comply with the relevant SANS codes.	Contractor	ECO / IECO	On-going	Construction
	5. Areas used for the storage of hazardous materials are to be clearly indicated as such.	Contractor	ECO / IECO	On-going	Construction
Hazardous and Flammable materials: Delivery	1. All deliveries (especially of hazardous nature) must be supervised.	Contractor	ECO / IECO	On-going	Construction
	2. Subcontractors and delivery companies should be informed of the delivery procedures and made aware of restrictions as to where materials may be stored.	Contractor	ECO / IECO	On-going	Construction

Construction Phase					
Objective	**Mitigation Measure**	**Executing Party**	**Monitoring Party**	**Timeframe**	**Project Stage**
	3. Loads must be secured to prevent spillage during transportation thereof.	Contractor	ECO / IECO	On-going	Construction
	4. Hazardous substances are to be transported in sealed drums or bags	Contractor	ECO / IECO	On-going	Construction
Hazardous and Flammable materials: Cement and / or concrete mixing	1. Limit cement and concrete mixing to single sites, where possible.	Contractor	ECO / IECO	On-going	Construction
	2. No mixing allowed directly onto the ground.	Contractor	ECO / IECO	On-going	Construction
	3. All visible remains of excess material will be treated as hazardous waste.	Contractor	ECO / IECO	On-going	Construction
	4. Solid concrete waste may be treated as inert construction rubble. However, wet cement and liquid slurry and cement powder must be treated as hazardous waste	Contractor	ECO / IECO	On-going	Construction
Hazardous and Flammable materials: Gas Storage	1. All combustible materials are to be store at least 3 m from any gas storage areas. In case of any flammable or any other gas storage areas, open flames, welding and cutting operations, smoking, etc. shall be prohibited in or near the storage area.	Contractor / ECO	ECO / IECO	On-going	Construction

Construction Phase					
Objective	**Mitigation Measure**	**Executing Party**	**Monitoring Party**	**Timeframe**	**Project Stage**
	2. No gas will be delivered until the site is registered with local Fire Safety.	Contractor / ECO	ECO / IECO	On-going	Construction
	3. Cylinders should always be stored in a well-ventilated area away from spark, flames or any source of heat or ignition.	Contractor / ECO	ECO / IECO	On-going	Construction
	4. Cylinders should always be handled, stored, used and transported in an upright position. It should not be dropped, dragged or rolled on their sides or allowed to skid. Cylinders that are too large to be carried shall be tilted and rolled on the rims of their foot rings or bases.	Contractor / ECO	ECO / IECO	On-going	Construction
	5. Valves should be kept properly closed.	Contractor / ECO	ECO / IECO	On-going	Construction
Hazardous and Flammable materials: Chemicals, Grease and Oil Storage	1. Storage areas must be bunded and hard surfaced in order to protect groundwater quality.	Contractor	ECO / IECO	On-going	Construction
	2. Compliance with SANS codes and hazardous substances bylaws should be adhered to.	Contractor	ECO / IECO	On-going	Construction
	3. All lids must be properly sealed / closed to prevent Volatile Organic Compounds (VOCs) and other potentially harmful gaseous compounds from escaping.	Contractor	ECO / IECO	On-going	Construction

Construction Phase					
Objective	**Mitigation Measure**	**Executing Party**	**Monitoring Party**	**Timeframe**	**Project Stage**
Hazardous and Flammable materials: Hydrocarbon spillages	1. Spill kits are to be made permanently available at areas which have the potential to be subjected to spillage of hazardous substances and dangerous goods.	Contractor	ECO / IECO	On-going	Construction
	2. Remediation of spillages must be conducted immediately and closed out within 24 hours.	Contractor	ECO / IECO / DWS / DESTEA	On-going	Construction
	3. No waste water or waste will be disposed of into the surrounding environment at any time. Water collected in bunded areas must be collected in containers and disposed of as hazardous waste.	Contractor	ECO / IECO	On-going	Construction
	4. Machinery will be kept maintained in line with manufactures specifications to minimise the risk of hydrocarbon spillages.	Contractor	ECO / IECO	On-going	Construction
	5. An incident reporting system will be implemented in order to ensure incidents, where spillages has occurred, are closed out and appropriate measures are taken to prevent further incidents.	Contractor	ECO / IECO	On-going	Construction
	6. Incidents must be reported to DWS within 24 hours.	Contractor	ECO / IECO / DWS	On-going	Construction

Construction Phase					
Objective	**Mitigation Measure**	**Executing Party**	**Monitoring Party**	**Timeframe**	**Project Stage**
	7. Contaminated soil must be disposed of in a hazardous materials skip and removed to a licensed hazardous landfill facility by a licensed contractor.	Contractor	ECO / IECO	On-going	Construction

Operational Phase					
Objective	**Mitigation Measure**	**Executing Party**	**Monitoring Party**	**Timeframe**	**Project Stage**
This phase consists of the use of the proposed pipeline. Maintenance and repair will be undertaken on the infrastructure when necessary.	1. Regular inspections of the pipeline are to be undertaken to identify leakages. These will be attended to immediately.	Applicant	DESTEA / DWS	On-going	Operation
	2. Maintenance and repair will be undertaken on the infrastructure when necessary.	Applicant	DESTEA / DWS	On-going	Operation
	3. Soil erosion occurrences will be attended to immediately.	Applicant	DESTEA / DWS	On-going	Operation
	4. Measures will be implemented to minimise the loss of water at any section.	Applicant	DESTEA / DWS	On-going	Operation
	5. Establishment of alien vegetation will be monitored and alien species will be removed by hand or by an approved chemical before gestation thereof.	Applicant	DESTEA / DWS	On-going	Operation

Operational Phase					
Objective	**Mitigation Measure**	**Executing Party**	**Monitoring Party**	**Timeframe**	**Project Stage**
	6. Visual inspections should be undertaken at least every 6 months to investigate the occurrence of sedimentation and erosion.	Applicant	DESTEA / DWS	On-going	Operation
	7. Proper erosion mitigation measures should be implemented.	Applicant	DESTEA / DWS	On-going	Operation
	8. Stabilise the banks of the watercourses, where necessary.	Applicant	DESTEA / DWS	On-going	Operation

Decommissioning Phase					
Objective	**Mitigation Measure**	**Executing Party**	**Monitoring Party**	**Timeframe**	**Project Stage**
It is not anticipated that the proposed project will cease in the nearby future. However, if decommissioning is decided upon, a rehabilitation plan will be developed and submitted for approval. The end-use of the area will be kept in mind during the compilation of the rehabilitation plan. Activities	1. Temporary structures and office sites (if any) will be dismantled and removed after completion of the construction phase of the project.	Contractor	ECO / IECO	On-going	Construction
	2. All waste, equipment, materials, etc. used during construction will be cleared from the site. The contractors will ensure that the site is cleared and rehabilitated to the satisfaction of the ECO.	Contractor / ECO	ECO / IECO	On-going	Construction
	3. An alien plant control and monitoring programme will be implemented.	Contractor	ECO / IECO	On-going	Construction
	4. The establishment of natural occurring vegetation will be encouraged at disturbed areas.	Contractor	ECO / IECO	On-going	Construction
	5. Re-vegetation of disturbed areas will be undertaken with site indigenous species.	Contractor	ECO / IECO	On-going	Construction
	6. Hydro-seeding will be implemented if the establishment of natural occurring vegetation does not occur within reasonable time.	Contractor / ECO	ECO / IECO	On-going	Construction
	7. After completion of the construction phase, a waterway monitoring program will be initiated that ensure that all are adequately rehabilitated.	Contractor	ECO / IECO	On-going	Construction

Decommissioning Phase					
Objective	**Mitigation Measure**	**Executing Party**	**Monitoring Party**	**Timeframe**	**Project Stage**
associated with the decommissioning phase will be limited to the rehabilitation of areas disturbed during the construction phase. All disturbed areas will be rehabilitated according to best practices. A rehabilitation plan will be developed, if it is decided to remove the proposed pipeline and	8. Temporary concrete surfaces (if any) will be removed and compacted areas ripped.	Contractor	ECO / IECO	On-going	During construction phase
	9. Establishment of extensive alien species will be monitored.	Contractor	ECO / IECO	On-going	During construction phase

Decommissioning Phase					
Objective	**Mitigation Measure**	**Executing Party**	**Monitoring Party**	**Timeframe**	**Project Stage**
associated infrastructure before the cessation of the operation aspects of the proposed project. The rehabilitation plan will include management and mitigation measures to be implemented during the decommissioning of the project					

No-Go Option					
Objective	**Mitigation Measure**	**Executing Party**	**Monitoring Party**	**Timeframe**	**Project Stage**
Keeping the status quo - Not construct the water pipeline.	1. The municipality will have to use trucks to transport potable water from adjacent towns. However, this option will largely depend on the accessibility of water from another source, availability of employees as well as suitable trucks. Note that the adjacent towns do not have enough potable water to provide their own areas as well as Senekal with their required volumes of water on a daily basis. Therefore, this option is not seen as a feasible option.	Applicant	DESTEA / DWS	On-going	N/A

APPENDIX H

Environmental Awareness Plan

ENVIRONMENTAL AWARENESS PLAN

THE PROPOSED CONSTRUCTION OF A SECTION OF A WATER PIPELINE TO CONNECT THE BLOEMSPRUIT WWTW TO MOCKES DAM, BLOEMFONTEIN

Proponent: Mangaung Metropolitan Municipality
MDA Ref No: 40673 2018
Date: April 2020

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1. Background

The aim of the current document is to make all employees, contractors, visitors, etc. aware of specific issues related to their surroundings, including biotic and abiotic elements, such as land, soil, plants, animals, air, water, as well as awareness of the built, social and economic surroundings as well as the impacts that the proposed project have on the mentioned elements.

2. Objectives for Environmental Awareness

It is important that the employees understand how each action of the project may influence the environment. It is just as important that each person understand the management strategies as it ensures that the impact on the environment is kept to a minimum.

The Environmental Awareness Plan should be sufficient to make all those involved in the proposed project aware of the risks that may occur as well as the necessary mitigation required to minimise the risks involved.

2.1. Target Groups

The target groups can be summarised as the management, administrative and general employees, as well as contractors.

2.2. Roles and Responsibility

2.2.1. Top Management

- Provide resources to ensure that the environmental awareness plan is implemented.

2.2.2. Environmental Team

- Approve all environmental awareness activities.
- Accountable for ensuring adequate resources are allocated for the effective implementation of the environmental awareness plan.
- Responsible for providing strategic direction for effective implementation of the environmental awareness plan.
- Responsible for overall establishment and implementation of environmental awareness plan.

- Ensure that environmental activities and information is communicated to the employees and contractors.
- Implement and drive the environmental awareness plan.

2.2.3. Employees and Contractors

- Adhere to and co-operate with management strategies as set out in the environmental awareness plan.

3. Implementation

The induction workshop will be conducted in order to inform all personnel (as well as contractors) that will be working on site of the Environmental Awareness Plan. During the induction, the risks for all aspects will be explained and the appropriate management options will be discussed. Monitoring programmes will also be discussed in order to identify and monitor the proposed project's impact on the environment and to discuss various remediation actions, should any deterioration be observed.

All employees will attend an induction workshop prior to the construction phase in order to ensure that all risks and mitigation measures are discussed prior to the occurrence of potential impacts. The workshop should be repeated to all new employees / contractors on site.

3.1. Induction

The Environmental Awareness Program must be implemented to:

- Develop and implement environmental education activities for all employees
- Organise environmental awareness activities on site
- Participate in environmental education

The constitution of the Republic of South Africa (1996) gives everyone the right to:

(a) An environment that is not harmful to their health or well-being

(b) To have the environment protected for the benefits of present and future generations through reasonable legislation in order to:
   (i) Prevent pollution and ecological degradation
   (ii) Promote conservation
   (iii) Promote justifiable economic and social development while protecting our environment.

Therefore, those who may cause pollution or other environmental degradations must take reasonable preventative measures to:

(a) Investigate, assess and evaluate the impacts
(b) Inform and educate employees about environmental risks associated with their work and the manner in which their tasks must be performed in order to avoid causing pollution or environmental degradation.

The induction workshop will focus on activities that carry an environmental risk, actions to be taken to reduce these risks and procedures to be followed in the event of an incident.

Environmental goals & objectives and the benefit of achieving such goals will be discussed as part of the induction workshop.

3.2. In-house training

In-house training events will be organised with relevant employees. The points to be discussed at these events will be determined by the relevant department. In addition, employees will participate in determining what environmental issues and / or concerns are relevant to their specific occupation.

The environmental incident report will also be discussed at these sessions.

3.3. Training during construction phase

3.3.1. <u>HoD Meetings</u>

The General Manager communicates information to senior management on environmental issues and the information is minuted.

3.3.2. SHEQ Meetings

Environmental issues are to be discussed at each of the SHEQ meetings. The responsible person for each of the environmental issues should also be appointed.

3.4. On the Job Training

Expected environmental issues and concerns specifically related to their occupation will be discussed with employees throughout the construction phase. Employees will be trained on how to respond to such environmental impacts.

3.5. General training & skills development

Training in basic environmental and pollution control skills will be given to employees working on site.

4. Evaluation of the Environmental Awareness Plan

The ECO will evaluate the Environmental Awareness Plan throughout the construction, operation and closure phase.

Environmental Awareness Plan	
Objective / Environmental parameter: General measures to consider	
Risks	**Mitigation measures**
• Negative impact on Environment, such as pollution, degradation, loss of vegetation, etc. • Surface and groundwater pollution.	• Any construction is disruptive and the environment must be given consideration with every activity undertaken • All relevant standards relating to legislation should be adhered to (including waste emissions, waste disposal, noise regulations, etc.) • According to Section 28 of the NEMA Act 107, every person who cause, has caused or may cause significant pollution or degradation of the environment must take reasonable measures to prevent such pollution or degradation from occurring, continuing or recurring and if it can't be avoided or stopped, to minimize and rectify such pollution or degradation of the environment. • The pollution control provision in Section 19(1) of the National Water Act (Act 36 of 1998) should be adhered to at all times.

Environmental Awareness Plan Objective / Environmental parameter: Planning phase	
Risks	**Mitigation measures**
• Loss of protected fauna and / or flora. • Loss of natural occurring vegetation • Contamination of soil / water resources No drinking water available to employees • Occurrence of veld fires Loss of artefacts / heritage material • Damage to nearby infrastructure • Startle domestic and wild animals • Damage to nearby infrastructure • Undertaking unauthorised activities	• Permits will be obtained for the removal / transplantation of protected species (if any) that are located within the construction area where no alternatives are possible. Care will be taken to prevent unnecessary damage to vegetation near to construction activities. • A monitoring system should be implemented to determine the occurrence (if any) of any fuel / oil spillages from the fuel tanks / wash-bay during the operational phase. • The necessary Environmental Authorisation will be obtained before any activities listed in the Regulations (Regulations 982, 983, 984 and / or 985 of 2014) are undertaken. • In addition, the necessary DWS registrations will be obtained, before any construction activities are undertaken. • The necessary precautions with regard to road safety will be implemented for construction work to be undertaken within road crossings (if any). • Proper sanitation, potable water and waste facilities will be in place before construction activities are undertaken. • A blasting permit will be obtained before blasting activities is undertaken (if any).

Environmental Awareness Plan	
Objective / Environmental parameter: Construction phase - general	
Risks	**Mitigation measures**
• Loss of natural occurring vegetation • Contamination of soil / water resources No drinking water available to employees • Occurrence of veld fires Loss of artefacts / heritage material • Damage to nearby infrastructure • Startle domestic and wild animals • Damage to nearby infrastructure	• Care will be taken to prevent unnecessary damage to vegetation near to construction activities. • The necessary Water Use Authorisations will be available on site. • The necessary precautions with regard to road safety will be implemented for construction work within road crossings (if any). • Proper sanitation, water and waste facilities will be in place for construction workers throughout the construction phase. • Chemical toilets will be cleaned and serviced regularly and proof thereof will be available on site. • Potable water will be made available daily to workers on site. • Fire-fighting equipment will be available on site, where applicable. • If artefacts or graves are uncovered during construction activities, work in the immediate vicinity will be stopped until the project Archaeologist and SAHRA has been consulted. • Adjacent landowners will be notified of proposed blasting, 24 hours prior to blasting activities.

Environmental Awareness Plan	
Objective / Environmental parameter: Water resources	
Risks	**Mitigation measures**
• Erosion • Undertaking of unauthorised activities • Contamination of stormwater • Contamination of soil • Contamination of surface and / or groundwater resources • Ponding of stormwater	• No activities will be undertaken within 32 m of a watercourse / within the 1:100 year floodline, without the necessary authorisations (for example from DESTEA and DWS). • Caution will be taken to ensure that construction materials are not dumped or stored within storm water management systems. • Emergency plans will be in place in case of fuel spillages (to limit the occurrence of soil as well as groundwater pollution). • A monitoring system should be implemented to determine the occurrence (if any) of any fuel / oil spillages from the fuel tanks / wash-bay during the operational phase. • The necessary mitigation measures should be implemented immediately, should any leakages / spills be detected. • Weather forecasts from the South African Weather Bureau of up to three days in advance will be monitored on a daily basis to avoid exposing soil or construction works or materials during a storm event and appropriate action will be taken in advance to protect construction works should a storm event be forecasted. • Construction activities in the storm water infrastructure will be limited through proper demarcation and appropriate environmental awareness training. The Contractor is responsible to inform all staff of the need to be vigilant against any practice that will have a harmful effect on waterways. • All no-go areas will be demarcated under guidance of the Environmental Control Officer (ECO). • Infilling, excavation, drainage and hardening of surfaces will not occur unnecessarily in storm water infrastructure. • The design of drainage systems will ensure

Environmental Awareness Plan	
Objective / Environmental parameter: Water resources	
Risks	**Mitigation measures**
	there is no contamination, eutrophication or increased. Drainage systems will be maintained regularly in order to minimize the runoff of harmful chemical substances into the waterway(s). • It will be ensured that the construction activities have minimal effects on the flow of water through the storm water infrastructure.

Environmental Awareness Plan	
Objective / Environmental parameter: Handling and Storage of materials	
Risks	**Mitigation measures**
• Contamination of stormwater, surface and or groundwater • Contamination of soil • Occurrence of veld fires	• All chemicals used during the development, including fuel, will be stored in a proper storeroom or protected area to prevent pollution. • Vehicles will be serviced at designated areas. No oil, diesel or other chemicals may be spilled or discharged anywhere. • Where applicable, the contractors will ensure that all relevant national, regional and local legislation regarding storage, transport, use and disposal of petroleum, chemical, harmful or hazardous substances and materials are adhered to, where necessary. • Cement and concrete mixing, if applicable, will only take place within the construction site. No concrete will be mixed directly on the ground. • All environmental problems occurring on the site such as chemical spillage, wasteful water disposal, etc. will be reported to the ECO. The ECO should implement best practices to rectify the impacts thereof on the environment. • Spill response equipment must be available during the handling and loading of hazardous waste (if any) • Hazardous substances (including the above ground fuel tanks) to be stored in bunded area. Bund walls will have a capacity of at least 110% of the total capacity of the stored volume. • No oil, diesel or other chemicals may be spilled or discharged anywhere and contact with bare soil should be avoided at all cost. • Drip trays will be used during the servicing of vehicles as well as the transfer of chemicals / substances from transportation vehicles. • All environmental problems occurring on the site such as chemical spillage, wasteful water disposal, etc. will be reported to the ECO. The ECO should implement best

Environmental Awareness Plan	
Objective / Environmental parameter: Handling and Storage of materials	
Risks	**Mitigation measures**
	practices to rectify the impacts thereof on the environment. • A monitoring system should be implemented to determine the occurrence (if any) of any fuel / oil spillages from the fuel tanks / wash-bay during the operational phase. • The necessary mitigation measures should be implemented immediately, should any leakages / spills be detected.

Environmental Awareness Plan	
Objective / Environmental parameter: **Waste Management (Note that waste refers to all construction debris and domestic waste generated due to construction activities.)**	
Risks	**Mitigation measures**
• Contamination of stormwater, surface and or groundwater • Contamination of soil • Occurrence of veld fires • Air pollution	• The contractor is responsible for the removal of construction waste. • Suitable containers will be placed on site to collect all solid waste. These will be emptied regularly. • No littering is permitted. During the construction period the site will be maintained in a neat and tidy condition. • All solid waste produced will be disposed of at an authorized landfill site. Recyclable waste may also be sold to recycling contractors. • No dumping, burning or burying of waste will be undertaken on site. • All hazardous waste will be disposed of at an authorized hazardous landfill site. • Recyclable hazardous waste may also be re-used or sold to recycling contractors. • Recyclable waste will be sold / re-used, where possible. • A waste management plan will be compiled and designed to ensure adequate waste management activities. • Areas used for waste storage and loading of materials should be lined and bund walls have to be erected to contain any spills that might occur.

Environmental Awareness Plan	
Objective / Environmental parameter: Soil, erosion and vegetation management	
Risks	**Mitigation measures**
• Contamination of surface and groundwater resources • Contamination of soil • Loss of topsoil • Loss of natural occurring vegetation • Erosion • Unsafe road • Occurrence of veld fires • Harm to animals • Slow regrowth of natural occurring vegetation • Establishment of alien vegetation	• Construction activities will be limited to designated construction areas to prevent peripheral impacts on surrounding natural habitats. Construction vehicles will also keep to constructed roads where possible, so that natural vegetation is not destroyed unnecessarily. • Access roads or temporary crossings must be non-erosive, structurally stable and not induce flooding / safety hazard. • If any access road or temporary crossing is impaired, it will be repaired immediately to prevent any future / further damage. • All human movement and activities will be contained within designated construction areas in order to prevent peripheral impacts on surrounding natural habitat. • Erosion management is important. Rehabilitation of disturbed areas will be undertaken to help the recovery of the vegetation. • Stockpiled material will be stockpiled in an area where it will not be disturbed by vehicles. • Stockpiled material will be protected from washing away during rainstorms. For example, one layer of bricks or stones can be placed around the stockpiled topsoil. • Stockpiled material will be placed on the cleared areas once construction is completed. Re-spreading of topsoil is preferably to be done to a maximum of 10 cm. • An alien control and monitoring programme will be developed starting during the construction phase and will be carried over into the operational phase. • Any proclaimed weed or alien species that germinates during the contract period will be cleared by hand / approved chemicals before flowering thereof. • Imported fill material will be monitored

Environmental Awareness Plan	
Objective / Environmental parameter: Soil, erosion and vegetation management	
Risks	**Mitigation measures**
	during and after construction for the presence of any alien species. Any such species will be removed immediately. • No open fires allowed. Provision will be made that no accidental fires are started. • No firewood will be collected on site or in surrounding areas, without written approval from the landowner. • Fire fighting equipment will be available on site. • Species, especially grasses, trees and shrubs occurring in the region will be used to rehabilitate disturbed areas. • No animals may be harmed / captured / trapped and / or hunted. This must be strictly enforced. • Animals found at the construction site will be removed and relocated to a suitable area. • Compacted soils (such as dirt tracks not to be utilised during the operational phase) must be ripped to ensure the establishment of natural occurring vegetation.

Environmental Awareness Plan	
Objective / Environmental parameter: Noise and dust control	
Risks	**Mitigation measures**
• Generation of nuisance noise • Generation of nuisance dust	• Construction activities will be limited to normal daytime hours. • Noise levels will be kept as low as possible during the construction phase in order not to disturb adjacent landowners. • Proper mitigation measures will be implemented to limit noise (e.g. the installation of silencers, where required). • Proper mitigation measures will be implemented to limit the formation of dust (e.g. wetting of construction area, when required). • The speed of the construction vehicles will be limited to avoid dangerous conditions, the formation of dust and the excessive deterioration of roads being used.

Environmental Awareness Plan	
Objective / Environmental parameter: Safety and Security	
Risks	**Mitigation measures**
• Health risks • Safety risks • Unsafe Road • Occurrence of veld fires	• The contractors will comply with the Occupational Health and Safety Act, National Building Regulations and any other national, regional or local regulations with regard to safety on site. Construction contracts will include safety and security measures for staff. • Precautions to ensure that construction staff and sites are visible and proper PPE will be provided to all employees. • Construction work within road reserves will accommodate road users as far as possible. This includes the following: • Roads will be crossed in half widths at a time to minimise the impact on vehicular traffic, where possible. • Construction along and across existing roads will be executed in such a manner that both pedestrian and vehicular traffic is accommodated at all times. • The contractor will be required to maintain adequate access to all public and private property at all times. • Contractor will supply, erect and maintain road signs for all work areas conforming to the prescribed layout and requirement of the South African Road Traffic Signs Manual and other relevant notices. • Fire extinguishers will be available on site and in the construction camp (if any). • The contractor will be required to maintain adequate access to all public and private property at all times.

Environmental Awareness Plan Objective / Environmental parameter: Heritage Management	
Risks	**Mitigation measures**
• Loss of heritage / archaeological / palaeontological artifacts	• Known heritage resources (if any) must be avoided as far as possible. • Employees should be encouraged and informed of the need to be on the look-out for potential fossils / buried archaeological material. • In the case of the discovery of any stone tools or other archaeological or palaentological material, the work in the immediate vicinity should temporarily cease and reported to the archaeologist and SAHRA. Should any human remains be exposed, the archaeologist as well as the local SAPS should be notified. • If any evidence of archaeological sites or remains (e.g. remnants of stone-made structures, indigenous ceramics, bones, stone artefacts, ostrich eggshell fragments, charcoal and ash concentrations), fossils or other categories of heritage resources are found during the proposed development, SAHRA APM Unit (Tel: 021 462 5402) must be alerted. If unmarked human burials are uncovered, the SAHRA Burial Grounds and Graves (BGG) Unit (Tel: 012 320 8490), must be alerted immediately. A professional archaeologist or palaeontologist, depending on the nature of the finds, must be contracted as soon as possible to inspect the findings. If the newly discovered heritage resources prove to be of archaeological or palaeontological significance, a Phase 2 rescue operation may be required subject to permits issued by SAHRA. 1. Appropriate measures should be undertaken by the ECO until the archaeologist / SAPS visits the site. This should include the following: - Site should be fenced with 'danger tape' - Position of finding should be recorded - Depth of finding should be recorded - Digital image of the finding should be taken • No information on the findings may be made public without the consent of the archaeologist / SAPS. • Construction activities in the area may only continue after approval from the archaeologist and SAHRA. • In the case of the discovery of any heritage, archaeological or palaeontological

	significance, the work in the area will be stopped and reported to the archaeologist and SAHRA. Any construction activities in the nearby vicinity may only commence after approval is obtained from SAHRA as well as the ECO.

Environmental Awareness Plan	
Objective / Environmental parameter: Site Clean-up and Rehabilitation	
Risks	**Mitigation measures**
• Contamination of surface and groundwater resources • Contamination of soil • Loss of topsoil • Loss of natural occurring vegetation • Erosion • Unsafe road • Occurrence of veld fires • Harm to animals • Slow regrowth of natural occurring vegetation • Establishment of alien vegetation	• Temporary structures and office sites (if any) will be dismantled and removed after completion of the construction phase of the project. • All waste, equipment, materials, etc. used during construction will be cleared from the site. The contractors will ensure that the site is cleared and rehabilitated to the satisfaction of the ECO. • An alien plant control and monitoring programme will be implemented. • Re-vegetation of disturbed areas will be undertaken with site indigenous species. Hydro-seeding will be implemented if the establishment of natural occurring vegetation does not occur within reasonable time. • After completion of the construction phase, a waterway monitoring program will be initiated that ensure that all are adequately rehabilitated.

Environmental Awareness Plan	
Objective / Environmental parameter: Operational Phase	
Risks	**Mitigation measures**
• Contamination of surface and groundwater resources • Contamination of soil • Loss of topsoil • Loss of natural occurring vegetation • Erosion • Unsafe road • Occurrence of veld fires • Harm to animals • Slow regrowth of natural occurring vegetation • Establishment of alien vegetation	• Regular inspections of the construction area, as well as the fuel tanks will be done to identify leakages. These will be attended to immediately in order to limit the occurrence of soil / groundwater pollution. • Soil erosion occurrences will be attended to immediately. • A monitoring system should be implemented to determine the occurrence of any fuel / oil spillages from the fuel tanks / wash-bay during the operational phase in order to ensure that no soil / groundwater pollution occur. • The necessary mitigation measures should be implemented immediately, should any leakages / spills be detected. • Measures will be implemented to minimise the loss of water at any section (including activities associated with the wash-bays) • Regular monitoring will be undertaken to ensure that no soil / groundwater pollution occur due to the activities associated with the operational phase. • An action plan will be available and implemented immediately, in case pollution of soil / groundwater occurs to ensure that it is rectified as soon as possible.

Environmental Awareness Plan	
Objective / Environmental parameter: Decommissioning / Closure	
Risks	**Mitigation measures**
• Contamination of surface and groundwater resources • Contamination of soil • Loss of topsoil • Loss of natural occurring vegetation • Erosion • Unsafe road • Occurrence of veld fires • Harm to animals • Slow regrowth of natural occurring vegetation • Establishment of alien vegetation	• It is not anticipated that the proposed project will cease in the nearby future. However, if decommissioning is decided upon, a rehabilitation plan will be developed and submitted for approval. The end-use of the area will be kept in mind during the compilation of the rehabilitation plan.

Environmental Awareness Plan	
Objective / Environmental parameter: Compliance and Monitoring	
Risks	**Mitigation measures**
• Contamination of surface and groundwater resources • Contamination of soil • Loss of topsoil • Loss of natural occurring vegetation • Erosion • Unsafe road • Occurrence of veld fires • Harm to animals • Slow regrowth of natural occurring vegetation • Establishment of alien vegetation • Undertaking of unauthorised activities • Non-compliance to EMPr / EA / DWS Authorisation	• The applicant will ensure that the contractors adhere to the recommendations of the EMPr and conditions of the Environmental Authorisation during construction. • An Environmental Control Officer (ECO) will be appointed to monitor the construction phase. Note that the ECO may be appointed separately or can be part of the contractor's team. • Regular monitoring and / or spot inspections at least every fortnight during the construction phase is recommended. • Inspections should be documented and any shortcomings addressed immediately. • An independent ECO will be appointed to monitor the construction phase. A report will be provided to the contractor upon completion thereof. The findings thereof should be made available to DESTEA, should it be requested. • Any emergency or unforeseen impact will be reported to the relevant environmental department within 24 hours after identification for telephonic approval and will be confirmed in writing. • During the operational phase the fuel tanks and associated infrastructure must be routinely audited and maintenance schedule adjusted accordingly in order to prevent leaking. • Material Safety Data Sheets (MSDS) should be available on site. Where possible and available, MSDS should include information on ecological impacts and measures to minimize negative environmental impacts during accidental releases or escapes.

Appendix I

Stormwater Management Plan

STORMWATER MANAGEMENT PLAN

THE PROPOSED CONSTRUCTION OF A SECTION OF A WATER PIPELINE TO CONNECT THE BLOEMSPRUIT WWTW TO MOCKES DAM, BLOEMFONTEIN

Applicant: Mangaung Metropolitan Municipality
MDA Ref No: 40673 2018
Date: April 2020

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1. Project description

The proposed project entails the proposed construction of a pipeline.

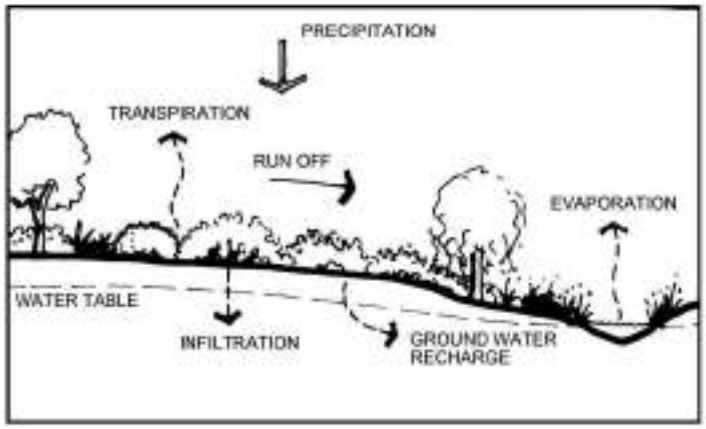
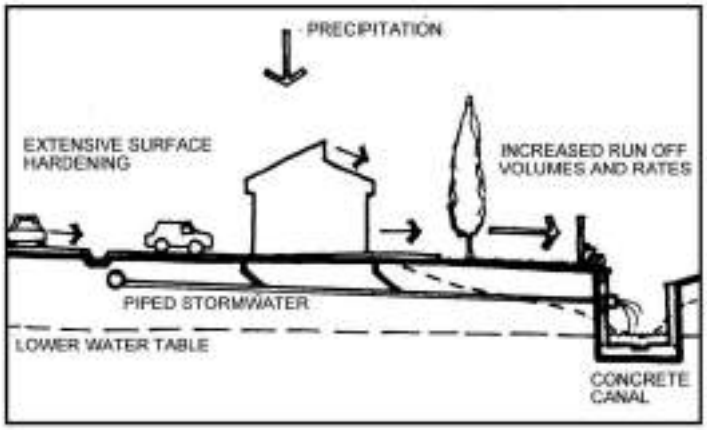
Please refer to the map in Appendix A of the Basic Assessment Report for an indication on the locality of the proposed activities.

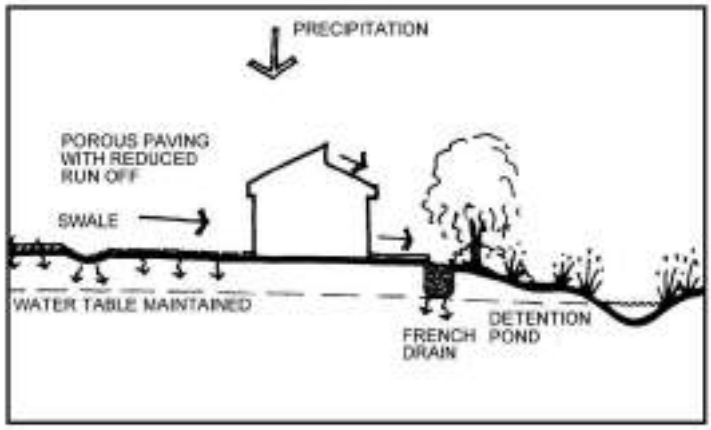
2. Stormwater Management Objectives

The main objective of the stormwater management plan is to minimise the effect of the proposed project on the environment. This objective can be divided into the following sections:

2.1 Minimising effect of proposed project on environment

The aim of the stormwater management plan is to minimise the effect of the proposed project on the environment (Figure 1).

Figure 1: Indication of effect of stormwater management in a developed area		
Nr	**Description**	**Drawing**
1	Natural Environment	
2	Developed Area, without sufficient stormwater mitigation measures being implemented	

3	Developed Area, with sufficient stormwater mitigation measures being implemented	

2.2 Minimalize the possibility of flooding

The minimisation of the possibility of flooding remains a key objective of any stormwater management system. However the challenge when contemplating design of stormwater management systems is to consider the following:

- To mimic pre-development responses to storms.
- To reduce the volume of runoff by promoting infiltration.
- To reduce the peak flows and increase the time-to-peak through detaining the runoff and releasing it at a gradual rate.
- Where necessary, to construct means to contain flood waters and safely convey them out of the urban area.

2.3 Protection of Receiving Water Bodies

The receiving water body is not necessarily the system into which stormwater is discharged directly, but can also be a natural system located further downstream in the catchment. Every endeavour should be made to achieve the following as far as possible:

- Maintain natural flow regimes and seasonality
- Prevent deterioration in water quality
- Prevent erosion or sedimentation of natural wetlands or rivers.
- Preserve natural river channels, wetlands and vegetation, and preclude engineering interventions that may alter their physical and ecological characteristics.

The need to design appropriate stormwater management systems for new developments should be seen as an opportunity to preserve or, if possible,

improve natural freshwater ecosystems that have suffered degradation as a result of past activities, and in some cases to create additional freshwater habitats that will contribute to the availability of appropriate, high quality river and wetland habitat that mimics the natural condition.

2.4 Promote Multi-Functional Use of Stormwater Management Systems

Resources such as land and water are becoming increasingly scarce and multiple uses of these must be strived for. Stormwater systems provide a wide range of opportunities for multi-functionality. These can have significant implications on:

- The initial and long term costs of development (e.g. Instead of constructing a detention pond and a sports field, these uses could be combined)
- The quality of the natural and urban environment [e.g. the pressure of private development requirements on land for public land use, conservation, etc. can be alleviated by combining compatible land uses such as conservation, recreation and stormwater systems (including wetlands, marshes, dams and rivers) enabling an improved natural and urban environment]
- Maintenance efficiency (e.g. instead of meeting the maintenance requirements of stormwater systems and public open space separately, they could be combined and could include walking/bicycle trails and parks).

2.5 Development of Sustainable Environments

The long-term involvement with the project and consideration of the sustainability of the stormwater management system that is to be implemented should be kept in mind. All relevant factors that will impact on future operation and maintenance should be taken into account. Environmental policies such as promoting the use of locally indigenous vegetation in planting programmes will also reduce the long-term maintenance requirements of the development.

3. Stormwater Planning Regarding the Proposed Project

Adequate planning is crucial to the success of the project as a whole.

3.1. Need for Multi-disciplinary Expertise

To maximise opportunities to manage stormwater, the input from various design teams are necessary (Table 1).

Table 1. Indication of the role that various team members play			
No	**Team member**		**Role**
1	Civil Engineer		An engineer skilled in the design of stormwater systems should determine runoff flows for the required recurrence intervals and proposed land uses and design appropriate measures to attenuate peak flows and safely convey the runoff.
2	Environmental Consultant		Alert the engineer at the conceptual stage of the development to crucial aspects of the environment, which are fulfilling an important role with respect to stormwater and should be taken into consideration, as well as opportunities for enhancement or rehabilitation of existing natural features.
3	If required	Freshwater Ecologist	Provide insight regarding the functioning of natural rivers, streams and wetlands and advice regarding the ecological aspects of the design of the components of the system, including water quality enhancement and the land needed for the system to function.
		Landscape Architect	Provide a holistic site analysis of the existing natural and man-made landscape and advice on the opportunities, constraints and implications of the site on the development planning and design.

3.2. Incorporation of Existing Information into Planning Stage

The following information (where relevant) should be investigated, during the planning stage and used to feed into more detailed site assessment:

- Catchment area in which the site is located
- Catchment or river management plans (overall management objectives and recommended key management actions with respect to runoff quantity, quality and other associated environmental and social issues, where such plans exist for the catchment in question, must be met in the design stage)
- Stormwater management master plan (identifies bulk infrastructure, including stormwater flow routes, required within developing areas and may identify particular issues such as pollution which must be addressed at a local level. The existence of a stormwater management master plan

which covers the area to be developed should be established and its recommendations applied to the design.
- Existing reports relating to the sensitivity of known wetlands / rivers / other natural ecosystems on or associated with the study area.

Interdependencies exist between the various water related services such as water supply, sanitation and stormwater management. Thus, consideration of the impact of effluent discharges into or water abstraction from stormwater management systems should be taken into account.

3.3. Site Analysis

The physical characteristics of the site reflect the existing course of runoff and stormwater. Working with the natural environment and environmental processes has been found to be safer, more sustainable and easier to maintain in the long term, than more traditional engineering approaches aimed at controlling these processes.

On sites that have been substantially disturbed, consideration should be made of what the natural drainage and runoff conditions would have been, as well as the existing situation. This will enable potential problems, and opportunities, to be identified.

3.3.1. Topography

The consideration of various topographical factors is important for the compilation of a stormwater management plan, due to the following:

- Gradients dictate the direction of flow and runoff/drainage routes can be plotted over land, identifying areas of ponding and concentration of loads
- In some areas which are very flat, earthworks may be required to provide sufficient grade for drainage
- Topography influences the potential for erosion to occur
- Topography informs the feasibility of different locations for stormwater routes, outlets and treatment areas; the main stormwater routes should be located along natural drainage routes
- In ecological terms, different habitats, some of higher conservation value than others, are frequently associated with changes in topography

- From an environmental and stormwater management perspective, as the slope increases, erf sizes should also increase to prevent excessive run-off and potential erosion
- Road and planning layouts should also reflect the topography of an area, to enable integrated stormwater design and management
- The commercial (and aesthetic) value of different sections of a development area is also frequently derived from different topographical characteristics.

3.3.2. Geology, Soils and Groundwater

The infiltration potential of the site is mostly determined by the geology, soil and groundwater conditions of the area. The following factors should be considered, where possible:

- Soil types affect surface permeability and hence rate of runoff
- The mapping of geology and soils will indicate areas of potential groundwater recharge
- Geology and soils influence the potential for erosion to occur
- Soil types should be identified, along with the characteristics of the different soils, such as levels of infiltration, permeability and their water-bearing capacity
- The presence of contaminated soils, which may pose a threat to surface and groundwater quality should be identified and plotted
- Areas of high groundwater levels can limit the possibilities and/or desirability of groundwater recharge and filtration methods.
- It should be noted that large-scale removal of certain vegetation types, such as Port Jackson (Acacia saligna) and Bluegums (Eucalyptus sp.), that consume large volumes of water, might significantly raise groundwater levels
- Need to determine seasonal and longer term trends in groundwater level fluctuation
- Soil types indicate the likely occurrence of particular plant communities, some of which may play a role in the stormwater management plan
- Assessing soils can also indicate the presence of both existing and even historic wetlands
- Seasonal variation of groundwater levels should be taken into account
- The geology and soils of a site will inform the feasibility of different locations for stormwater treatment areas and the potential for groundwater recharge

- Different habitats (some with high conservation value) are associated with specific geological features and soils

3.3.3. Climate

The following climatic factors should be considered, where necessary:

- Storm rainfall parameters are major design factors and must be carefully determined
- The general climatic characteristics of an area will also impact on the site and stormwater systems implemented, i.e. whether the site is generally waterlogged or dry and if evaporation levels are high or low
- Microclimate conditions can inform the spatial layout of water treatment and attenuation, particularly those associated with specific planting and multifunctional uses

3.3.4. Hydrology

It is essential, for successful, sustainable and integrated stormwater management, that the existing and/or natural hydrological response and functions of the site are understood. The following factors should be considered:

- The natural drainage that was characteristic of the development area, to the extent that this is possible, should be determined and both the irreversible as well as less permanent changes that have taken place should be identified
- The hydrology of the development area is a function of much of the other data, which is described under the Site Analysis section.

3.3.5. Cultural and Historical Landscapes and Archaeological Sites

Areas, routes, vegetation and landmarks that have a cultural and/or historical use or significance should be identified. Development and stormwater planning should avoid disturbing these areas where possible. Where possible they should generally be incorporated within the public open space of a development. This contributes a further function to the public open space system, and should be integrated into a network of public open space.

3.4. Development Requirements

The public open space and pedestrian access requirements of a development should be incorporated into the stormwater management planning of the site. The integration of public open space and access requirements with the spatial requirements of stormwater management not only reduces the conflict of pressure on land, but also enables the amalgamation of maintenance requirements, and maximises the use of resources. The following factors should be considered (where necessary):

- Land use planning should be done in relation to the natural context and characteristics of the site. The appropriate placement of land uses will enhance the multi-functionality of the stormwater systems and their use as an amenity by residents in the area.
- Innovative opportunities exist for future stormwater management systems to link-up and add value to educational initiatives (outdoor classroom), ownership (friends groups adopting the system), and water saving (re-use of stormwater/treated effluent for irrigation).
- These opportunities are also area specific and need to be identified up front, rather than as a nice-to-have-after-thought
- The need for a safe environment must be taken into account (e.g. avoid of potential hiding places for criminal elements; do not create unnecessary hazards in the selection of stormwater management options).
- The cost of stormwater implementation, management and maintenance, as well as flood risk, can be greatly reduced by identifying, retaining and enhancing the natural areas along which runoff and natural habitat retain ecological integrity. The advantages of this approach are not limited to stormwater, but can increase the visual, amenity and ecological value of a development.

3.5. Site Planning

3.5.1. Analysis

The developer should take the information stipulated in Section 2.3 into consideration during the Site Analysis Process.

3.5.2. Conceptual Layout

A general concept plan for the site layout should be developed, taking into account the legal and physical aspects of the site as developed through the site analysis process.

3.6. Design Phase

3.6.1. Appropriate Stormwater Management Facilities and Techniques associated with the project

Various stormwater management facilities and techniques were evaluated in terms of engineering, ecological, health, safety, aesthetic, social, construction and maintenance design objectives.

Various facilities and techniques may be utilised to manage stormwater runoff from the development.

3.6.2. Conveyance

Conveyance can be summarised as the use of natural or artificial channels, natural or artificial wetlands or pipes and culverts for stormwater conveyance as well as the prevention of erosion.

In general terms, the developer should consider the following aspects when selecting designs for stormwater conveyance:

- The slopes of the development area – stormwater design on steep slopes will need to incorporate methods for reducing erosion.
- Soil type and stability in the development area – the former will affect infiltration rates, as well as the potential for establishment of different kinds of plant communities in unlined conveyance structures; the latter will affect the degree of stabilisation that may be necessary.
- Seasonal changes in water table height – groundwater should not be exposed by unlined conveyance structures during summer, as this will promote drainage of the groundwater resource; infiltration capacity will be reduced if the water table is above an unlined channel base during winter.
- The cost of land – where land is at a premium, use of large areas for stormwater conveyance may be prohibitively expensive. Nevertheless, the increase in aesthetic and other forms of amenity value that may be

gained from sensitive and imaginative stormwater designs may make the use of such space more economically feasible.

- The anticipated quality of stormwater runoff – severely polluted water may constitute a health hazard to downstream residents and an ecological hazard to downstream aquatic ecosystems. Consideration should be given to the conveyance of such water off-site, and directly to water purification works, at least during low-flow periods when water quality is likely to be most impacted.
- Presence of natural water bodies that would lend themselves to the conveyance of stormwater
  - Habitat integrity, priority ranking and/or ecological importance and sensitivity of the system should be considered
  - Sensitive systems should be protected from, rather than incorporated into stormwater conveyance design.
- The volume of expected stormwater runoff, during within-year flood events, and during larger storm events.
- The availability of open space for stormwater conveyance – large areas of open public or private space often lend themselves to the creation of wide, artificial waterways, which may also have ecological, recreational and aesthetic value in addition to providing a stormwater function.
- The presence of litter and sediment which would result in blockages.

Erosion is unfortunately often associated with development as areas become disturbed or as stormwater runoff is concentrated at outlets. In order avoid these problems, options such as stabilisation, energy dissipation and the design of stormwater management systems, which do not concentrate flows, are recommended. A number of structures incorporated into stormwater design play a role in the dissipation of energy required to prevent erosion at outlet and inlet points, and at various points in different conveyance structures. This section provides brief commentary on the ecological, engineering and aesthetic function of each of these.

Soil which has been disturbed or from which the vegetation has been removed, should be stabilised to prevent erosion due to wind or runoff. Such erosion could cause the stormwater system to block, thereby resulting in the flooding of properties. Stabilisation would be short term, for the duration of the construction phase, followed by long term on completion of construction. Particular care should be taken of areas where development will not take place immediately on completion of the construction phase, e.g. wide verges in the road reserve which have been acquired to accommodate future road widening, or erven reserved for unspecified local authority use.

3.7. Construction

3.7.1. Civil Engineering Specifications

All materials and workmanship should comply with the SABS Specifications.

3.7.2. Environmental Management Programme

Please refer to Appendix G of the Basic Assessment Report for a copy of the EMPr.

3.7.3. Protection of Stormwater Systems during the Construction Phase

The proposed construction activities will be undertaken in the dry season (winter months), where possible in order to limit impacts on the flow of stormwater. The above will also be included in the documentation to the contractor.

3.7.4. Vegetation and Stabilisation

Structures that rely on infiltration for their efficacy should not come into operation until their runoff areas have been stabilised, following construction. This will prevent the need for early and costly maintenance of structures.

If stabilisation by planting is envisaged, plants should be established before the onset of the winter rains. A phased approach to construction should be considered, where the extent of the water course is such that planting of the whole area will take too long for stabilisation to be effective, or where construction activities are likely to take longer than the period between the end of the wet season and the end of the dry season, when planting should take place.

In some cases, delays in the design or tender stages of a project result in delaying construction such that plants are unlikely to be established before the start of the rainy season. Planting during the rainy season is likely to result in the costly loss of plants, due to washout, as well as the erosion of banks, often resulting in the destruction of careful landscaping of bank slopes and profiles. In such cases, it is suggested that planting be delayed until after the end of the rainy season – either until spring, or until the following autumn. Planting in late spring would allow a longer period for the establishment of plants before the next rainy season. However, for all zones except for

permanently wetted zones, frequent irrigation would be necessary to ensure the survival of the plants over summer.

Delays in planting are likely to have cost implications for the project as a whole: survival of pre-ordered, potted plants is often not good over a whole year; in addition, regarding and shaping of eroded banks may be necessary. Nevertheless, it should also be noted that there are advantages to such delays in planting – for one thing, it allows water levels and rates of flow to be observed over one year, and these observations can be used to guide plant zonation.

It is strongly recommended that any planting programmes carried out in stormwater management systems make use of locally indigenous plant species. Indigenous species tend to require less costly nurturing than do exotics. Moreover, they are often less prone to disease and, from an ecological perspective, can also provide areas of indigenous habitat, potentially linking areas of natural indigenous habitat, across the development area.

4. Stormwater Management Plan (Construction phase)

Given the project and site information as listed in the sections above it is possible to compile a Storm Water Management Plan in order to manage and limit possible environmental, surface and groundwater impacts associated with stormwater runoff.

4.1. Potential Pollution sources

The areas and activities that require particular attention with regard to the potential negative impacts of uncontrolled stormwater runoff need to be identified. The potential pollution sources related to the proposed project can be listed as follows:

- Construction base camp
- Stockpile area
- Trench excavation
- Concrete mixing

4.2. Preventative measures and stormwater management tools

The following preventative measures and Management tools can be implemented in order to minimise and prevent the negative effects of storm water impacts for the identified pollution sources as well as other project related activities.

4.3. General preventative measures and stormwater management tools during the construction phase

- The applicant will ensure that the contractors adhere to the recommendations of the of the EMPr as well as conditions set out in the Environmental Authorisation during construction
- An Environmental Control Officer (ECO) will be appointed to monitor the entire construction phase. Note that the ECO can be appointed independently or as part of the contractor's team.
- Regular monitoring and / or spot inspections must be conducted. It is recommended that the above mentioned monitoring / spot inspections occur at least every fortnight during the construction phase.
- Inspections must be documented and any shortcomings must be addressed immediately.
- An independent ECO will be appointed to monitor the construction phase. A report will be provided to the contractor upon completion thereof. This report and its findings should be made available to the environmental department if requested.

4.4. Construction base camp

- Proper sanitation, portable water and waste facilities must be in place before construction activities commence.
- Care must be taken to prevent any unnecessary damage to vegetation near construction base camp and any other construction activities.
- Potable water must be made available to workers on a daily basis.
- Caution must be taken to ensure that no construction materials are stored or dumped within 32 meters of a watercourse or buffer zones.
- Emergency plans must be available in case of any spillages into or near water resources.
- All chemicals used during the development, including fuel for the construction vehicles, will be stored in a proper storeroom or protected area to prevent pollution.

- Vehicles will be serviced at designated areas. No oil, diesel or other chemicals may be spilled or discharged anywhere.
- Where applicable, the contractors will ensure that all relevant national, regional and local legislation regarding storage, transport, use and disposal of petroleum, chemical, harmful or hazardous substances and materials are adhered to, where necessary.
- Cement and concrete mixing, if applicable, will only take place within the construction site. No concrete will be mixed directly on the ground.
- All environmental problems occurring on the site such will be reported to the ECO. The ECO should implement best practices to rectify the impacts thereof on the environment.
- The contractor is responsible for the removal of construction waste.
- Construction activities will be limited to designated construction areas to prevent peripheral impacts on surrounding natural habitats. Construction vehicles will also keep to constructed roads where possible, so that natural vegetation is not destroyed unnecessarily.
- All human movement and activities will be contained within designated construction areas in order to prevent peripheral impacts on surrounding natural habitat.
- The area where the construction base camp will be set out should be flat in terms of surface and not situated within 32meters from existing water courses.
- A temporary impervious surface should be provided where equipment and/or any hazardous materials (cement, lime, oil and fuel) can be stored, handled and used.
- In the event of any spillage incident the spillage should be cleaned, removed and discarded at the nearest authorised disposal facility.
- Chemical toilets must be serviced and cleaned regularly by the contracted entity.
- All and any waste generated by the construction workers must be disposed of in bins provided, these bins should be emptied and taken to the nearest applicable disposal facility on a regular basis.

4.5. Stockpile area

- Removed topsoil will be stockpiled in an area where it will not be disturbed by vehicles.
- Stockpiled material will be protected from washing away during rainstorms. For example, one layer of bricks or stones can be placed around the stockpiled material.
- On-site contractors are responsible for maintaining stockpiles.

- Weather forecasts from the South African Weather Bureau of up to three days in advance must be monitored on a daily basis in order to avoid exposure of soil, construction works or other harmful materials during a possible storm event.
- Weather forecasts must also be used as a tool to ensure that appropriate actions are taken to avoid the runoff/ erosion of topsoil or other stockpiled materials.
- The temporary stockpiling of soils or any other material should preferably be stored on flat surfaces, in flat topped mounds with side slopes not exceeding a 1:2 slope.
- The stockpiling of soils or other materials should occur more than 32meters from a water course on a relative flat surface.
- In the event of a surplus material or material unsuitable for backfilling however designated to remain onsite for landscaping, shall as early as possible be placed in its permanent position, be covered with top soil and vegetated.
- Stockpiled material will be placed on the cleared areas once construction is completed. Re-spreading of topsoil is preferably to be done to a maximum of 10 cm, depending on the natural depth.
- An alien control and monitoring programme will be developed starting during the construction phase and will be carried over into the operational phase.
- Any proclaimed weed or alien species that germinates during the contract period will be cleared by hand / approved chemicals before flowering thereof.
- Imported fill material will be monitored during and after construction for the presence of any alien species. Any such species will be removed immediately.

4.6. Trench Excavation

- Infilling, excavation, drainage and hardening of surfaces will not occur unnecessarily in water ways (i.e. permanent, seasonal or temporary) water courses or within 32 meters of them. The 32 meter buffer zone should be extended in cases where slope in combination with rainfall can potentially provide conditions for the transportation and deposition of materials within the applicable water resource.
- The total depth of excavation will be kept to a minimum, where possible.
- All trenches should be backfilled as soon as possible.
- Trenching shall not proceed unreasonably far ahead of pipe laying (if any) - especially in cases where a steep gradient exists.

- The time period for the construction or associated activities within and close proximity of streams should be kept to a minimum.
- Temporary mounds or sandbags shall be placed along the route of all backfilled trenches in order to prevent washout.

4.7. Mixing of concrete

- Cement mixing should take place on impermeable liners.
- The cleaning of cement mixing and related equipment will be conducted using proper cleaning trays.

4.8. Other activities related to the project

- Site clearance:
  - Vegetation should not be stripped for the entire construction site at project commencement.
  - Phased vegetation clearance as the project continues is advised.

- Topsoil strip:
  - Should only commence on areas where immediate work will commence.
  - The extent of these areas should be limited to a minimum and only commence as work progresses to new areas.
  - The period of time between completion of topsoil removal and the commencement of earthworks should be kept at a minimum.
  - The topsoil and seedbank should be stripped, and stockpiled separately and protected against weed infestation and erosion
  - Topsoil should be replaced on top of the soil surface from which it was removed as soon as possible.

5. Stormwater Management Plan (Operational phase)

It is not anticipated that the project should pose further negative potential stormwater impacts after construction, however the following Preventative measures and stormwater management tools should be implemented after the construction phase:

- After the completion of the construction phase a water way monitoring programme will be initiated to ensure the entire area is adequately rehabilitated.

- Following the completion of construction of all infrastructures, the area might be susceptible to erosion due to certain disturbances, areas should be evaluated post construction and determined.
- The areas found to be susceptible to erosion should be equipped with gabions or other geotextiles in order to prevent extensive erosion.
- Following the cessation of construction activities that took place in streams, streams should be inspected regularly for erosion and the necessary mitigation should be applied in order to rectify the situation and prevent further erosion.
- Any and/ all areas that have been compacted due to construction activities must be ripped and rehabilitated to its original state.
- After the cessation of construction related activities the area must be rehabilitated and transformed to its original state.
- The re-establishment of natural occurring vegetation should be monitored. Hydro- seeding should be implemented if natural re-establishment methods fail.
- After construction has ceased all construction materials should be removed from site.
- Regular inspections of the site should be conducted to identify leakages, poor vegetation regrowth and or any erosion occurrences. Soil erosion occurrences will be attended to immediately.

6. Summary of stormwater mitigation measures to be implemented

6.1. Prevent concentration of stormwater flow at any point where the ground is susceptible to erosion.
6.2. Reduce stormwater flows as far as possible by the effective use of attenuating devices (such as swales, berms, silt fences). As construction progresses, the stormwater control measures are to be monitored and adjusted to ensure complete erosion and pollution control at all times.
6.3. Minimse the area of exposure of bare soils to minimse the erosive forces of wind, water and all forms of traffic.
6.4. Ensure that development does not increase the rate of stormwater flow above that which the natural ground can safely accommodate.
6.5. Ensure that all stormwater control works are constructed in a safe and aesthetic manner in keeping with the overall development.
6.6. Design culvert inlet structures to ensure that the capacity of the culvert does not exceed the pre-development stormwater flow at that point.
6.7. Design outlet culvert structures to dissipate flow energy. Any unlined downstream channel must be adequately protected against soil erosion.

6.8. Permits will be obtained for the removal / transplantation of protected species (if any) that are located within the proposed road route where no alternatives are possible. Care will be taken to prevent unnecessary damage to vegetation near to construction activities.
6.9. The necessary Environmental Authorisation will be obtained before any activities listed in the Regulations (Regulations 982, 983, 984 and / or 985 of 2014) are undertaken.
6.10. Proper sanitation, potable water and waste facilities will be in place before construction activities are undertaken.
6.11. Care will be taken to prevent unnecessary damage to vegetation near to construction activities.
6.12. Potable water will be made available daily to workers on site.
6.13. No activities will be undertaken within 32 m of a watercourse / within the 1:100 year floodline, without the necessary authorisations (for example from DESTEA and DWS).
6.14. Emergency plans will be in place in case of spillages into the water resource(s).
6.15. All no-go areas will be demarcated under guidance of the Environmental Control Officer (ECO).
6.16. All chemicals used during the development, including fuel for the construction vehicles, will be stored in a proper storeroom or protected area to prevent pollution.
6.17. Vehicles will be serviced at designated areas. No oil, diesel or other chemicals may be spilled or discharged anywhere.
6.18. Where applicable, the contractors will ensure that all relevant national, regional and local legislation regarding storage, transport, use and disposal of petroleum, chemical, harmful or hazardous substances and materials are adhered to, where necessary.
6.19. Cement and concrete mixing, if applicable, will only take place within the construction site. No concrete will be mixed directly on the ground.
6.20. All environmental problems occurring on the site such will be reported to the ECO. The ECO should implement best practices to rectify the impacts thereof on the environment.
6.21. The contractor is responsible for the removal of construction waste.
6.22. Construction activities will be limited to designated construction areas to prevent peripheral impacts on surrounding natural habitats. Construction vehicles will also keep to constructed roads where possible, so that natural vegetation is not destroyed unnecessarily.

6.23. All human movement and activities will be contained within designated construction areas in order to prevent peripheral impacts on surrounding natural habitat.
6.24. Erosion management is important. Rehabilitation of disturbed areas will be undertaken to help the recovery of the vegetation.
6.25. Removed topsoil will be stockpiled in an area where it will not be disturbed by vehicles.
6.26. Stockpiled material will be protected from washing away during rainstorms. For example, one layer of bricks or stones can be placed around the stockpiled material.
6.27. Stockpiled material will be placed on the cleared areas once construction is completed. Re-spreading of topsoil is preferably to be done to a maximum of 10 cm, depending on the natural depth.
6.28. An alien control and monitoring programme will be developed starting during the construction phase and will be carried over into the operational phase.
6.29. Any proclaimed weed or alien species that germinates during the contract period will be cleared by hand / approved chemicals before flowering thereof.
6.30. Imported fill material will be monitored during and after construction for the presence of any alien species. Any such species will be removed immediately.
6.31. The total depth of excavation will be kept to a minimum, where possible.
6.32. Species, especially grasses, trees and shrubs occurring in the region will be used to rehabilitate disturbed areas.
6.33. An alien plant control and monitoring programme will be implemented.
6.34. Re-vegetation of disturbed areas will be undertaken with site indigenous species.
6.35. Soil erosion occurrences will be attended to immediately.
6.36. The applicant will ensure that the contractors adhere to the recommendations of the EMPr and conditions of the Environmental Authorisation during construction.
6.37. An Environmental Control Officer (ECO) will be appointed to monitor the construction phase. Note that the ECO may be appointed separately or can be part of the contractor's team.
6.38. Regular monitoring and / or spot inspections at least every two weeks during the construction phase is recommended.
6.39. Inspections should be documented and any shortcomings addressed immediately.

6.40. An independent ECO will be appointed to monitor the construction phase. A report will be provided to the contractor upon completion thereof. The findings thereof should be made available to DESTEA, should it be requested.

6.41. The drainage system for the site should be designed to specifications that can adequately deal with a 1:50 year intensity rainfall event or more to ensure sufficient capacity for carrying storm waters around and away from infrastructure.

6.42. Procedures for storm water flow through a project site need to take into consideration both normal operating practice and special circumstances. Special circumstances in this case typically include severe rainfall events.