

ASSESSMENT OF ALTERNATIVES

1. IDENTIFYING ALTERNATIVES

The IEM procedure (Department of Environmental Affairs) stipulates that the environmental investigation needs to consider feasible alternatives for proposed developments. This means that for anyone development proposed there should consist of a number of possible proposals or alternatives for accomplishing the same objectives or meeting the same need. These guidelines suggest that alternatives be evaluated according to the following criteria:

- Location,
- Activity, and
- No action / No-go alternative.

The environmental assessor embarked on an extensive analysis of "feasible" alternatives as part of this Environmental Impact Study - an account of the alternatives that have been considered, is provided below.

Alternatives for the project, as well as for project design, were evaluated according to the guidelines provided by the Department of Environmental Affairs.

A number of alternatives have come to light - some alternatives were already known and some came to light during the specialist investigations that have been conducted. Hereunder a description is given of such feasible alternatives.

Alternatives are discussed in the following manner;

- the extent and significance of each identified environmental impact (only "significant issues"), will be elaborated upon, and
- the possibility for mitigation of each identified environmental impact will be elaborated upon.

In each instance below, the identified alternatives that are provided are linked to a number of significant potential impacts that might result from the proposed development.

For clarification purposes, the writer will first define the following terms, in order that the reader has a clear understanding what is meant by the terms **alternative & mitigation**.

Alternative: A possible course of action, in place of another, that would meet the same purpose and need (of a proposal). Alternative proposals can refer to any of the following but are not limited to:

- alternative sites for development,
- alternative projects for a particular site,
- alternative site layouts,
- alternative designs,
- alternative processes,
- alternative materials.

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Mitigation: The implementation of practical measures to reduce adverse impacts or enhance beneficial impacts of a proposed action. Proposed mitigation measures can influence (reduce) the significance of an impact (if designed and implemented correctly). Mitigation should specify how, where and when measures to reduce adverse impacts or enhance beneficial impacts, should be implemented.

2. LOCATION/SITE ALTERNATIVES

2.1. Introduction

Location alternatives were considered on account of the following impacts that might result from the establishment of the proposed pipeline:

- **Impact / Issue:** Impacts resulting from potential damage to fauna & flora.
- **Impact / Issue:** Impacts upon the visual environment (visual resource) and "sense of place".
- **Impact / Issue:** Various impacts resulting from development within floodline area.
- **Impact / Issue:** Impacts upon heritage resources (graves, archaeological sites etc.).

The extent of the above impacts is respectively: **Immediate, Immediate adjacent areas, the Site & Immediate.**

The significance of the above impacts are respectively: **Medium-High, Medium, Low-Medium & Medium-High.**

2.2. Feasible alternatives

Several challenges had to be overcome when initially identifying/selecting a site for the proposed pipeline. The main challenge was finding a site that could be developed without,

- unnecessarily stressing the environment,
- unnecessarily impacting on heritage resources,
- unnecessarily eroding the visual resource of the area,
- inducing negative impacts on adjacent areas/properties.

The site to which this application applies meets all of the above challenges, as;

- enough space for the installation of the pipeline is available (sufficient land is available),
- negative impacts on adjacent area/properties resulting from the establishment of the pipeline will be minimal due to the pipeline mainly being installed adjacent to existing infrastructure (eskom lines, other pipelines and roads) and other areas where the environment has already been disturbed (cultivated fields).
- No/limited impact on the riparian zone will occur, as the area is severely modified and degraded (See Appendix D - Riparian Report for Stream Crossings).
- unnecessary stressing/impacting of the environment can be mitigated through the

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implementation of the recommendations contained in the attached EMPr.

Alternative positions for the components of the proposed development were considered based on the biophysical attributes of the area where the pipeline is to be developed. No amendments to the pipeline routes were required based on the Ecological sensitivity assessment that has been conducted. The alternative 2 route is the preferred alternative from an ecological point of view for the following reasons:

Tshamahansi route:

Alternative 2 is only located approx. 10m from the original route but is located closer to the existing pipeline where the area is already disturbed.

Bakenberg route:

Alternative 2 is located to the south of the original planned route and is located further away from the sensitive rocky outcrops. The alternative 2 route will also follow an existing powerline in the eastern portion which will have less impact on the vegetation.

The Ecological Report made the following conclusion and recommendations regarding the proposed route for the pipeline:

The conservation value and site sensitivity of the larger part of the sites is low except where the route crosses the streams & rocky areas. Most of the proposed pipeline route will take place in townships, demarcated areas for future development, mining areas, fragmented housing development areas associated with old lands, cultivated land, illegal waste dumping sites where it will also follow the road and existing infrastructure such as power lines and water pipelines. The alternative 2 route will also follow an existing powerline in the eastern portion which will have less impact on the vegetation.

The alternative 2 route is located to the south original planned route and avoids the rocky outcrops. Mitigation measures will also ensure that stream crossings are stabilized. The proposed development is supported under the condition mitigation measures are adhering too. The proposed development is supported under the condition that the following mitigation measures are adhering too:

- Planting of succulents such as *Aloe marlothii* around reservoirs or other structures and degraded kopjes is important.
- Rehabilitation of all stream crossings with hydro seeding and cover net or gabion sheets will limit erosion (if required).
- Rock packing may be necessary on the steep slopes along the Rooisloot and Borobela stream.
- Only trees within the construction site should be removed whilst most trees outside construction site should be left intact. A permit is needed before a protected plant is removed.

Alternative routes for the proposed pipelines were considered based on the heritage significance of the area where the pipelines are to be developed. An Archaeological Impact Assessment was conducted of the proposed pipeline routes. Two alternatives for each route were assessed, referred to as the Bakenberg section and the Tshamahansi section. During the survey 23 heritage features were recorded for Alternative 1 (both Bakenberg and Tshamahansi sections). These consist of cemeteries, Late Iron Age stone walled sites and find spots, ruins, stone cairns of unknown purpose and an African church classified as living heritage. For

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Alternative two 13 features were recorded consisting of cemeteries, ephemeral stone walls and rectangular foundations, stone cairns of unknown purpose and an African church classified as living heritage. 9 of the 13 features were recorded on the Tshamahansi section and are also recorded on Alternative 1 (as part of the 23 heritage sites recorded for Alternative 1), as the two alternatives run parallel to each other 10 m apart. See Appendix D: Archaeological Impact Assessment Report for co-ordinates of the sites and features.

The Archaeologist indicated the following recommendations are applicable if Alternative 1 is chosen:

Iron Age (Field No. 582, 583, 592, 595 and 603)

- 583 & 595. Preservation of the site *in situ* or mapping of the site and excavation before a destruction permit can be applied for.
- 582 & 592. No further action necessary. 592 is also well outside of the pipeline servitude and will not be directly impacted.
- 603 preservation of the site *in situ*. If this is not possible it must be determined if this is a grave through social consultation and Ground Penetrating Radar (GPR). If it is a grave relocation of the site adhering to all legal requirements.

Ruins (Field no. 588 and 605)

Although these sites are of low significance it must be kept in mind that sites like these might contain unmarked graves and it is recommended that these sites are preserved and demarcated with danger tape during the construction period. If these sites cannot be preserved the lack of graves on these sites should be confirmed during the social consultation process. If graves are present on the site these should be protected *in situ* and if this is not possible relocated with the required permits. A chance find procedure must be included in the EMP to monitor and mitigate accidental finds in these areas.

If the sites will be destructed the age of the structures must be determined and if the structures are older than 60 years the sites are protected by the Act and permits must be applied for prior to destruction.

Cemeteries (Field No. 585 – 591, 597, 600, 601, 602)

Although it is possible to relocate graves (adhering to all legal requirements) this must be seen as a last resort. It is rather recommended that the cemeteries are preserved *in situ* with a 20 meter buffer and the pipeline rerouted in these areas. These rerouted areas will have to be assessed by an archaeologist.

Stone Cairns (Field No. 584, 593, 598, and 599)

The cairns are of unknown purpose and it is recommended that these sites should be avoided. If this is not possible the possibility of these being graves should be investigated during the social consultation process and possibly GPR.

Living Heritage (Field No. 606)

The site is of significance to the local community and is classified as living heritage. The site will not be directly impacted by the line. It is recommended that the leaders of the church should be informed about the project.

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The impact of alternative 1 is high on heritage resources and therefore Alternative 2 is the preferred option from a heritage point of view. The following recommendations apply to the additional sites identified in the impact area of Alternative 2.

Grave (Field No. 619)

It is recommended that the grave site should be demarcated and retained in situ.

Ruins (Field No. 620 and 622, 623)

Site 620 and 622 is part of one recent/ historical settlement complex. Graves in this area, outside the impact zone, date from as early as 1922 and therefore the settlement can be older than 60 years in which case additional destruction permits are required if impacted on and will require mitigation measures (mapping of the site, chance find procedures). The site could be of significance to the local community as they have direct ties to the site. It is recommended that site 620 – 622 should preferably be avoided altogether and that the pipeline should be realigned to ensure that the site is not impacted on. If this is not possible and the site will be impacted on the presence of unmarked graves and age of the settlement should be confirmed during the public participation process.

623 has been destroyed by agricultural activities to such an extent that it cannot contribute to our understanding of the heritage of the area and no in situ surface features occur. It is recommended that the presence of graves in the area should be confirmed during the public participation process and that a chance find procedure should be in place.

General

Several small stone heaps are found across the area that was not recorded (e.g. S23° 53' 51.1" E28° 51' 56.5"). It is recommended that through the social process the presence of unmarked and informal graves should be determined in the pipeline corridor and that these sites should be mitigated accordingly.

No cultural landscape elements were noted in the proposed corridor. Visual impacts to scenic routes and sense of place are also considered to be low as the line follows existing development servitudes and will be subsurface.

From a heritage perspective alternative 2 is the preferred option as it will have the least impact on recorded heritage sites and features. In order for the project to proceed several recommendations and mitigation measures will have to be implemented as outlined in Section 6 and 8 of the AIA report (subject to approval from SAHRA).

The possibility of the occurrence of subsurface finds cannot be excluded. Therefore if during construction any possible finds such as stone tool scatters, artefacts or bone and fossil remains are made, the operations must be stopped and a qualified archaeologist must be contacted for an assessment of the find and therefore chance find procedures should be put in place as part of the EMP.

Chance finds procedure:

This procedure applies to the developer's permanent employees, its subsidiaries, contractors and subcontractors, and service providers. The aim of this procedure is to establish monitoring and reporting procedures to ensure compliance with this policy and its associated procedures. Construction crews must be properly inducted to ensure they are fully aware of the procedures regarding chance finds as discussed below.

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- If during the construction, operations or closure phases of this project, any person employed by the developer, one of its subsidiaries, contractors and subcontractors, or service provider, finds any artefact of cultural significance, this person must cease work at the site of the find and report this find to their immediate supervisor, and through their supervisor to the senior on-site manager.
- It is the responsibility of the senior on-site Manager to make an initial assessment of the extent of the find, and confirm the extent of the work stoppage in that area.
- The senior on-site Manager will inform the ECO of the chance find and its immediate impact on operations. The ECO will then contact a professional archaeologist for an assessment of the finds who will notify the SAHRA.

If the recommendations as made in the AIA report are adhered to (subject to approval from SAHRA) there is from an archaeological point of view no reason why the proposed project should not proceed.

The recommendations of the Heritage Assessment Practitioner have been taken into account and alternative route no. 2 will be the preferred route for the construction of the pipeline. The pipeline route has also been diverted to exclude the heritage significant areas (Site 620 and 622 - recent/ historical settlement complex).

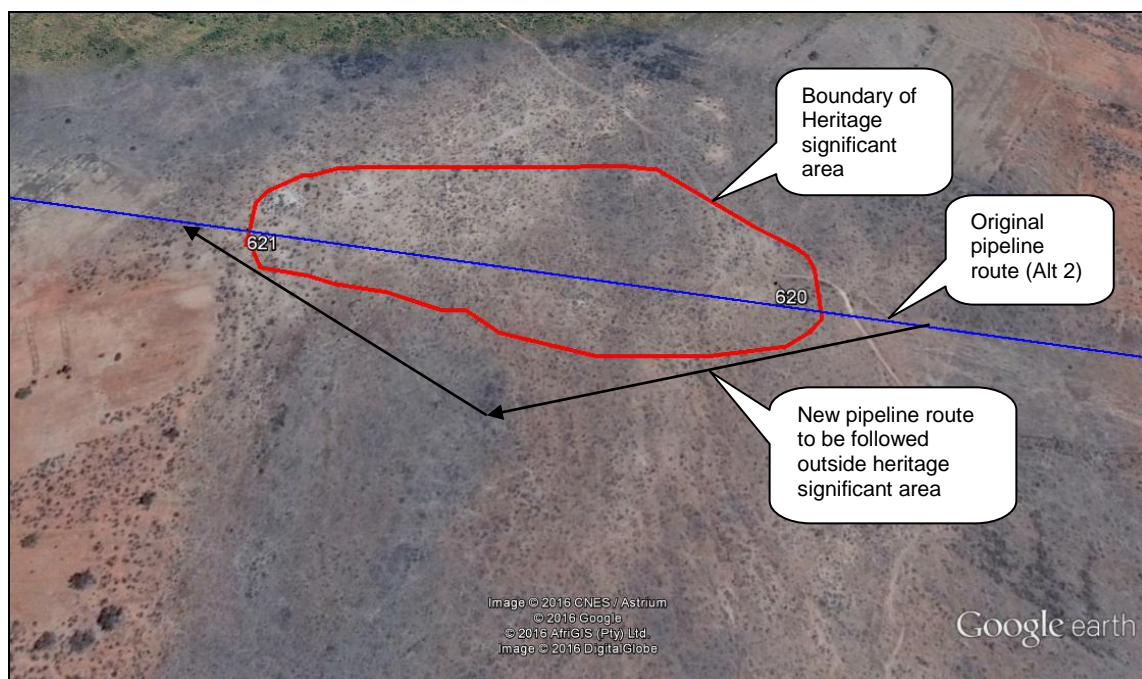


Figure 1: Pipeline rerouted to exclude the heritage significant areas (Site 620 and 622 - recent/ historical settlement complex).

3. ACTIVITY ALTERNATIVES

3.1. Introduction

Activity alternatives were considered on account of the following impacts that might result from the installation of the proposed pipeline:

- **Impact / Issue:** Impacts resulting from damage to fauna & flora.
- **Impact / Issue:** Impacts upon the visual environment (visual resource) and "sense of place".
- **Impact / Issue:** Impacts resulting from the generation of waste (especially during the construction phase).
- **Impact / Issue:** Impacts resulting from the generation of traffic (especially during the construction phase)
- **Impact / Issue:** Impacts resulting from the generation of noise (especially during the construction phase)

The extent of the above impacts is respectively: **Immediate, Immediate adjacent areas, Immediate, Sub-regional** and **Immediate**.

The significance of the above impacts are respectively: **Medium - High, Medium, Low, Low-Medium** and **Low-Medium**.

3.2. Feasible alternatives

Construction activity:

During the construction phase there are "activity alternatives" that should be considered, in order to limit the impact on the environment.

The most significant impact upon the biological environment will manifest during the construction period when disturbance of the natural environment will take place. As an alternative to conventional construction methods, it is proposed that an "Environmental Management Programme (EMPr) for construction" be compiled that can provide guidelines to contractors on alternative ways of conducting construction activities and to lessen the overall impact of construction. The EMPr is attached to the Basic Assessment Report.

Alternatives allow people who are not directly involved in the project (e.g. I&APs), to evaluate various aspects of the proposed project and how they were arrived at. It also provides a framework for the relevant authority's (DEDET's) decision-making process. If unforeseen difficulties arise during the construction or operation of the project, re-examination of these alternatives may help to provide rapid and cost-effective solutions.

During construction of pipeline the width of the area that is cleared for construction purposes, should be kept as narrow as possible, so as to minimise disturbances to the environment.

Contractors should remove all waste generated by themselves during the construction period and it should be disposed of at a suitable solid waste disposal site - "dumping in the bush" should not take place.

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Fauna (especially avifauna) may be temporarily displaced from the area during construction due to the noise and activity. The immediate proximity of other available habitat in the surrounding environment means that this impact is of moderate significance. Birds (e.g. guinea fowl and francolin etc.) might be snared - this must be prevented. Animals and reptiles that fall into trenches should not be killed.

Exit ramps must be constructed in the trenched areas to allow animals, which might have fallen into the trenches to get out. Corridors (open areas) must also be left between the trenched areas to allow animals access to cross the pipeline route during construction.

Activity alternatives during operational phase:

Limited impacts will result during the operational phase of the pipeline.

Basic requirements (considerations) for minimising impacts on the environment include the following:

- Identifying potential impacts and already providing for them at an early stage,
- Consideration of long-term measures that would contribute towards (environmental) sustainability of the proposed development,
- Regular monitoring of potential environmental threats (e.g. the introduction of alien plants, access to biologically sensitive areas, erosion control etc.).

4. NO ACTION ALTERNATIVE

The "no-action: alternative was considered on account of the following impact that might result from the establishment of the proposed pipeline:

- **Impact / Issue:** Impact resulting from damage to the biological environment.
- **Impact / Issue:** Impacts upon heritage resources (graves, archaeological sites etc.).

The extent of the above impact is: **Immediate, Immediate.**

The significance of the above impact is: **Medium, Medium-High.**

In this instance the "no action" option was not considered an alternative, due to the fact that implementation of the recommendations contained in this document would contribute to minimising possible impacts that might result from the construction and operation of the proposed water supply project.

The consequences of "non-establishment" of the proposed water supply pipeline:

- a) The proposed pipelines form part of the Mogalakwena Municipality's Master Water Plan. The said pipelines will form part of the network to distribute water to the Greater

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Mokopane area. The water supply capacity will therefore remain problematic if the proposed pipeline is not constructed.

- b) Several job opportunities will be created during the construction period. Local labour will be used as far as possible. The operational phase will also require people to be involved in the operation and maintenance of the activity.

The non-establishment of the proposed pipeline would mean that these opportunities would not be created for local contractors and local civic engineers.

- c) The negative impact of the proposed development is the loss of natural habitat and visual impact. The planning of the proposed pipeline route has however been planned in such a way that the pipeline will be installed adjacent to existing infrastructure (eskom lines, existing pipelines and roads) as far as possible and where the environment has already been disturbed (cultivated fields). Plants (especially succulents) in the way of construction activities should be removed and replanted after construction of the pipeline.
- d) Another negative impact of the proposed development is the impact on heritage resources (i.e. graves and other archaeological sites). The planning of the proposed pipeline route has however been amended to exclude such areas as per the recommendation of the Heritage Assessment Report.