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Director

Environmental Screening for Site Selection for Project Lima

EXECUTIVE SUMMARY

The environmental screening of the three prospective sites with a number of options for the pumped storage scheme in the Steelpoort Valley considered the following factors:

- **Biophysical**
  - Terrestrial Ecology (including fauna and flora)
  - Riverine Ecology
  - Water Quality
  - Hydrology
- **Social**
  - Agricultural potential
  - Displacement of persons
  - Heritage
  - Health and safety (including HIV/Aids)
  - Access route (accessibility to site)
  - Visual (deterrent in ecological scenic environment)
  - Infrastructural development (water, electricity, etc.)
- **Economic**
  - Loss of local income due to project
  - Generation of employment by project
- **Enviro-Legal (NWA, CARA, ECA, NEMA)**

The screening assessment made use of a rating system (5 being a positive impact and 1 being a fatal flaw). The ratings were then summed and an overall ranking derived. The results of the assessment are presented in the following table.

The environmental assessment indicates that two options are suitable, Site C Option 1 and Site A Option 3.

Environmental Issue	Site A Option 1	Site A Option 2	Site A Option 3	Site B Option 1	Site B Option 5	Site B Option 7	Site C Option 1
Biophysical							
Fauna (including birds)	2	2	3	2	2	2	4
Flora	2	2	2	2	2	2	4
Riverine ecology	2	2	2	2	2	2	4
Water quality	4	4	4	3	4	3	2
Hydrology (including wetlands)	2	2	3	3	4	3	4
Social							
Agricultural potential	4	4	4	3	4	4	2
Displacement of persons	2	2	4	4	2	3	4
Heritage	2	3	3	**2**	**2**	**2**	4
Health and safety (including HIV/Aids)	2	2	4	4	4	4	2
Access route (accessibility to site)	4	4	4	2	2	2	4
Visual (deterrent in ecological scenic environment)	4	4	2	3	3	2	4
Infrastructural development (water, electricity, etc.)	5	5	5	5	5	5	5
Economic							
Loss of local income due to project	2	4	4	4	4	4	2
Generation of employment by project	5	5	5	3	3	3	5
Enviro-Legal (NWA, CARA, ECA, NEMA)	2	2	3	3	3	3	2
Total Score	44	47	52	45	46	44	52
Ranking	**6**	**3**	**1**	**5**	**4**	**6**	**1**

Environmental Screening for Site Selection for Project Lima

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Environmental Screening for Site Selection for Project Lima

1 INTRODUCTION

The BKS Environmental Management Department was appointed by Eskom via the BKS-Palace Consortium to carry out an Environmental Screening Investigation (ESI) for the three site options of Project Lima.

Eskom is planning to construct a pumped storage power generation facility in the Steelpoort area. Phase I of the project will comprise a comparison and ultimate selection of potential sites for the facility. Phase II will comprise the optimalisation of the layout and preliminary design, including the start of the EIA regulatory process in terms of the Environment Conservation Act. This ESI only covers the environmental inputs during Phase I.

The purpose of the ESI is to identify, using readily available information, potential environmental (biophysical, socio-economic and enviro-legal) issues of concern. The ESI is not an environmental impact assessment and therefore does not quantify any environmental issues. The ESI is also not required by current legislation, but serves as a valuable tool to identify issues which could influence the outcome of the project.

The ESI should serve as input for the next phase of the project, namely the EIA Regulations process.

2 ENVIRONMENTAL SCREENING INVESTIGATION REPORT

This ESI report documents the results of an environmental screening assessment for the proposed Steelpoort Pumped Storage Scheme. Three different major sites were assessed, with a number of options for each site. For further details on these sites and options, refer to the site description section in the main report (Sections 2.1 and 2.4). The environmental screening considered the following factors:

- Biophysical
    - Terrestrial Ecology (including fauna and flora)
    - Riverine Ecology
    - Water Quality
    - Hydrology
- Social
    - Agricultural potential
    - Displacement of persons
    - Heritage
    - Health and safety (including HIV/Aids)
    - Access route (accessibility to site)
    - Visual (deterrent in ecological scenic environment)
    - Infrastructural development (water, electricity, etc.)
- Economic
    - Loss of local income due to project
    - Generation of employment by project
- Enviro-Legal

The screening assessment has been undertaken using a rating approach. The rating system used was as follows:

Positive Impact (rated at 5 points) – Sufficient information exists to consider a positive impact.

Favourable (rated at 4 points) – Sufficient information exists to make a considered rating that the overall environmental impact would not be significant.

Uncertain (rated at 3 points) – There is uncertainty on the nature and extent of the impact primarily due to a lack of information on site specific conditions.

Less Favourable (rated at 2 point) – Sufficient information exists to determine that the site will be negatively impacted.

Fatal flaw (rated at 1 point) – where there could be an impact which cannot be mitigated.

The rating for each of the aspects considered was then totalled and the site with the highest number of points would be the preferred site. All the sites and options were then ranked according to their score.

3 DESCRIPTION OF AFFECTED ENVIRONMENT

The sites are located in the Limpopo Province. The sites are located in two quarter-degree grids, with Site C in 2429DD, and Sites A and B in 2529BB (see Figure 1, Appendix 1). All of the sites are located on the eastern escarpment of the Nebo Plateau, to the west of the Steelpoort River. The altitudes of the sites vary between 800 and 2000 meters above mean sea level (mamsl). The sites are located within the Sekhukhuneland Cross Boundary District Municipality with Sites A and B situated within the Greater Groblersdal Local Municipality, and Site C located within the Makhudutamaga Local Municipality. Townships are located on the escarpment near to the sites, with cultivation practices occurring on the level areas in the valleys and plateau.

The major river in the B4 sub-drainage region is the Steelpoort River and its smaller tributaries. The Steelpoort River forms the Western border of the region. The Spekboom River drains the eastern part of the region and has its origin near the town of Lydenburg, and flows into the Steelpoort River near the end of the region. The Dwars River drains the area between the Steelpoort and Spekboom River. The main reservoir of this area is the Buffelskloof Dam and is situated in the Dwars River.

The main land use features in this region are agriculture (citrus, vegetables, corn and maize), low industrial development, various mining activities, residential areas and tourism.

Sites A and B lower and upper dams are relatively undisturbed and no current farming occurs on the sites. Site C upper dams are currently being used for agricultural activities. Site C lower dam is the proposed De Hoop Dam

Rainfall patterns are typical of the eastern half of the country with the highest rainfall occurring during the summer months (October to March). Annual rainfall for the area is approximately 878mm, with the highest 24-hour rainfall occurring in December. Temperatures generally vary between 7°C and 20°C, with the highest recorded

temperature being 32°C and the lowest -8°C (South African Weather Service, 2006). Frost occurs every year for an average of 25 days. Frost normally occurs between May and September, but may occur as early as March and as late as October (Soil and Irrigation Research Institute, 1987).

Table 1. Average temperatures for the region

Month	T max	T min
January	23	12
February	22	12
March	22	11
April	20	8
May	18	4
June	15	1
July	16	1
August	18	3
September	22	6
October	22	8
November	22	10
December	23	11

Reference: South African Weather Services, 2006.

4 DESCRIPTION OF PROJECT

Hydro power is currently the world's largest renewable source of electricity, accounting for 6% of worldwide energy supply or about 15% of the world's electricity. There are three general types of hydroelectricity:

- Run of River Hydroelectricity – where electricity is generated from within a river;
- Hydroelectric Dams – where dams are constructed along a river to harness water for later use in generating electricity;
- Pumped Storage Schemes – which take excess power from power stations and uses it to pump water from one reservoir to another at a higher level. At times of peak electricity demand, the water is let back down through turbines, generating more electricity.

Although pumped storage sites are not net producers of electricity - it actually takes slightly more electricity to pump the water up than is recovered when it is released - they are a valuable addition to electricity supply systems. Their value is in their ability to store electricity for use at a later time when peak demands are occurring. Additionally, hydroelectric power stations can be brought online in seconds.

From a positive environmental impact side, hydroelectric power plants do not emit any of the standard atmospheric pollutants such as carbon dioxide or sulphur dioxide given off by fossil fuel fired power plants. In this respect, hydro power is better than burning coal, oil or natural gas to produce electricity, as it does not contribute to global warming or acid rain. Similarly, hydro-electric power plants do not result in the risks of radioactive contamination associated with nuclear power plants.

5 TERRESTRIAL ECOLOGY

5.1 FLORA

The sites are located on two vegetation types described by Low and Rebelo (1998). The vegetation types are Mixed Bushveld (18) and Moist Sandy Highveld Grassland (38). Acocks (1988) also indicates two vegetation types occurring on the site, but with different distributions. The two vegetation types are Mixed Bushveld (18) and Sourish Mixed Bushveld (19). Vegetation type 18 covers almost 29% of the Limpopo Province but only 1.57% is conserved, while vegetation type 38 covers only 0.04% of the Limpopo Province without any current conservation status. Almost 7.5% of vegetation type 19 is conserved in the Limpopo Province.

The sites are also located within the Sekhukhuneland Centre of Endemism. The centre is located within the rain shadow of the Drakensberg, and is therefore relatively arid compared to the surrounding areas. Climatically this region comprises an arid (karoid) subtropical (lowveld) enclave surrounded by areas that are temperate (frost in winter) and much wetter (particularly towards the north, east and south) (van Wyk and Smith 2001).

The major plant communities found within the centre relates to soil properties, aspect and terrain (Siebert et al 2003), which explains why this area is floristically noteworthy in that many rare and endemic species with localised distribution correlate with the geological substrate that occurs here (Siebert et al 2003).

Siebert (2001) conducted a survey on the vegetation of the Sekhukhuneland Center of Endemism as part of his Philisophiae Doctor Degree. The general vegetation present at the various reservoirs is described in his thesis. Six basic vegetation types have been recorded during the study of which five of the communities occur on the sites.

The communities of interest are the following:

1. ***Fuirena pubescens – Schoenoplectus corymbosus*** Wetland Vegetation
2. ***Themeda triandra – Senecio microglossus*** Cool Moist Grasslands
3. ***Combretum hereroense – Grewia vernicosa*** Open Mountain Bushveld
4. ***Kirkia wilmsii – Terminalia prunioides*** Closed Mountain Bushveld
5. ***Hippobromus pauciflorus – Rhoicissus tridentate*** Rock Outcrop Vegetation

1. ***Fuirena pubescens – Schoenoplectus corymbosus*** Wetland Vegetation

This community occurs scattered throughout the entire area, on the banks of streams and in depressions in the valleys, associated with seeps on the mountain slopes and on the mountain plateaus. The most prominent soil in this community is black vertic clay soils. The vegetation type is dependant on abundant water for at least part of the year. There is floristic affinity between this vegetation community and the *Themeda triandra – Senecio microglossus* Cool Moist Grasslands.

The most important indicator species for this community is *Fuirena pubescens* and *Schoenoplectus corymbosus*. The diagnostic woody species in this community is Salix *mucronata* and the diagnostic forb and sedge species are *Artemisia afra, Conyza scabrida, Chironia purpurascens, Fimbristylis ferruginea, Fuirena pubescens* and *Schoenoplectus corymbosus*. Diagnostic grasses include *Andropogon eucomis, Imperata cylindrica, Miscanthus junceus* and *Hyparrhenia hirta*, with *Cymbopogon validus* and *Hyparrhenia filipendula* additional dominant species.

Of all the mayor communities identified in the area this community has the lowest number of species of concern (only three species). The community represents all the wetlands in the area, including riverine wetlands, and is therefore a sensitive community which should receive conservation priority.

Species of concern include an endemic form of *Acacia karroo* and *Nuxia gracilis*, an Insufficiently Known near-endemic.

2. ***Themeda triandra – Senecio microglossus*** Cool Moist Grasslands

This grassland has a very high species diversity and occurs on the higher altitude undulating hills and the high altitude plateau. The community occurs on shallow clay soils over norite. The vegetation consists of dense grassland species with a few

scattered woody individuals. The high altitudes, frost and high rainfall are a prerequisite for the occurrence of this major community. Fire maintains the grassland, but does not result in the occurrence of Grasslands. Without fire the grassland will degenerate to a less pristine condition.

The indicator species for this community are *Dieteropogon amplectens* and *Senecio microglossus*. The diagnostic species for this community includes the woody species *Protea caffra* and *Elephantorrhiza elephantine*, and the forbs *Acalypha punctata*, *Clerodendrum triphyllum* and *Thesium gracilentum*. Abundant forbs include *Berkheya insignis*, *Gnidia caffra, Hypoxis rigidula, Senecio latifolius* and *Senecio microglossus*. Dominant and conspicuous grasses include *Brachiaria serrata, Diheteropogon amplectens, Elionurus muticus, Setaria sphacelata, Themeda triandra* and *Tristachya leucothrix.*

The highest number of species of concern in the area occurs in this vegetation type. The grassland community is therefore very sensitive and should be conserved.

3. ***Kirkia wilmsii – Terminalia prunioides*** Closed Mountain Bushveld

This major vegetation type occurs on clay mountain slopes with underlying norite and pyroxenite, mostly in an undulating landscape. The vegetation type has a well developed grass layer, with trees between 2 m and 5 m high.

The relatively warmer and drier climate allows this bushveld vegetation type to occur on the slopes of the mountain and lower hills, instead of the grassland vegetation of the higher elevations.

The most important indicator species for this vegetation type are *Dichrostachys cinerea* and *Panicum deustum*. *Acacia nigrescens, Commiphora mollis, Acacia Senegal var. leiorachis, Combretum apiculatum, Kirkia wilmsii* and *Terminalia prunioides* are the dominant and diagnostic trees and shrubs occurring in the community. Prominent forb and grass species include *Clerodendrum ternatum, Barleria saxatilis, Psiadia punctulata, Sanseviera hyacinthoides, Aristida canescens, Enneapogon scoparius, Heteropogon contortus* and *Panicum deustum*.

Several species of concern has been observed in this vegetation type, including two undescribed species.

4. ***Combretum hereroense – Grewia vernicosa*** Open Mountain Bushveld

This community is patchily distributed throughout the region and normally occurs in anomalous soils with a weak structure and high concentrations of heavy metals, as well as magnesium and calcium. These soils have a high erosion potential.

The occurrence of this vegetation type is strongly associated with geology and soils. The aridity and metalliferous soils are responsible for the harsh niche that has been filled by a specific group of plant. The species present in this major community occur in the other major communities as well, but are mostly stunted in this community. The community is therefore very distinctive.

The indicator species of this community is *Combretum hereroense* and *Loudetia simplex*. Prominent, abundant and diagnostic woody species include *Brachylaena ilicifolia, Ozoroa sphaerocarpa, Combretum hereroense, Grewia vernicosa, Tinnea rhodesiana* and *Vitex obovata* subsp. *wilmsii. Euphorbia enormis, Orthosiphon fruticosus, Commelina africana, Kyphocarpa angustifolia* and *Phyllanthus glaucophyllus* are frequently occurring forbs. The dominant grasses are *Enneapogon scoparius, Heteropogon contortus* and *Themeda triandra* (see Plate 1).

Plate 1: Typical Open Mountain Bushveld

Various species of concern were recorded in this vegetation type, including the greatest number of endemic species. An important species observed in the vegetation type is *Euphorbia barnardii*, an endangered species.

5. ***Hippobromus pauciflorus – Rhoicissus tridentate*** Rock Outcrop Vegetation

This community is scattered throughout the area as bush clumps, or stages of it. It occurs mainly in sheltered areas of rock outcrops, including ridges and flats. The structure of the community is closed woodland or open shrub land, with a strong floristic link to afromontane vegetation (see Plate 2).

Plate 2: Typical Rock Outcrop Vegetation

The indicator species of this vegetation type is *Celtis africana* and *Aloe arborescens*. Other prominent woody species include *Maytenus undata, Acacia ataxacantha, Aloe castanea, Combretum molle, Cussonia transvaalensis, Hippobromus pauciflorus* and *Rhoicissus tridentate*. Important forb species include *Cyphostemma woodii, Gerbera jamesonii, Orthosiphon labiatus, Tetradenia brevispicata* and *Xerophyta retinervis. Aristida transvaalensis* and *Cymbopogon excavatus* are the dominant grass species.

Various species of concern occur in this community, with a large number restricted to this community only.

5.2 FAUNA

Due to the wide range of habitats occurring at the sites it can be expected that a large number of fauna can occur there.

The Groothoek Greeff Private Nature Reserve is located a short distance to the north of Site A, between Site A and Site B. Some of the species that occur on the Private Reserve are likely to migrate to suitable areas surrounding the site (See Plate 3).

Plate 3: Groothoek Greeff Private Nature Reserve

Bird life in the area is very rich, due to the diverse habitat present in the area. The quarter degree grid 2529BB provides habitat to 305 bird species (Sites A and B). Site C is located within the quarter degree grid 2429DD, in which 171 bird species have been identified.

A total of 78 mammal species may possibly utilise the site. Large mammal species such as the red hartebeest, wildebeest and warthog has been observed during site visits. It is expected that various other large mammals occur in the area as well as a number of small mammals.

A large number of reptile species possibly occur in the various habitats on the site. One tortoise species, one terrapin species, 38 snake species and 15 lizard species can possibly occur on the site.

Small wetlands are important for frogs and play a large role in the metapopulation dynamics of certain taxa (Channing 1995). Frogs are aptly referred to as bio-indicator species, whose abundance and diversity reflect the general health and

well-being of aquatic systems. Nine amphibians may possibly utilise the riverine areas at Sites A and B (Minter et al. 2004). No Red Data amphibian species are expected at any of the three sites (see Plate 4).

Plate 4: Habitat for amphibians (Tributary at Site A Lower)

Southern Africa is blessed with an extremely high diversity of insects with more than 80 000 species already recorded. They are the most abundant and successful terrestrial species, occupying almost every habitat type except the sea. Insects are essential in the various roles within ecosystems, e.g. nutrient recycling, plant pollination, maintenance of plant community composition and other insectivorous animals. Each insect forms part of a wider ecosystem, and if lost, the complexities and abundance of other life will be affected. While some insects have a negative effect on human lives, others are necessary to our survival (Scholtz & Holm 1989; Gullan & Cranston 1994). In many ecosystems insects are the main grazers and play a vital role in the decomposition of plant and animal wastes (Picker et al. 2004).

Scorpions occur in every terrestrial habitat in Southern Africa and in many cases some have a preference for highly specialised habitats (Leeming 2003). In general, scorpion species are not protected by the Conservation Ordinance (1983) but an increase in knowledge regarding distribution data as well as potential threats represented by habitat fragmentation and destruction has led to some species being recognised as being in need of protection.

It is expected that due to the high biodiversity, a large number of invertebrate species will utilise the site.

5.3 SPECIES OF CONCERN

The World Conservation Organisation (IUCN) has three threatened categories, namely Critically Endangered, Endangered and Vulnerable. Species that have been evaluated according to the IUCN criteria and do not fall into one of the threatened categories can be classified as Least Concern, Near Threatened or Data Deficient. Species classified as Least Concern have been evaluated and do not qualify for the Critically Endangered, Endangered, Vulnerable or Near Threatened categories. Species that are widespread and abundant are normally included in this category. Species are classified as Near Threatened when they do not meet the criteria for the threatened categories, but are close to classifying as threatened or will likely classify as threatened in the near future. A species is classified as a Data Deficient species when there is a lack of appropriate data on the distribution and/or population status of the species. The species may be well studied, and the biology known, but data on the abundance and/or distribution are not available. The category indicates that more data is needed and that there is a possibility that the species may be classified into one of the threat categories in the future. Vulnerable species are facing a high risk of extinction in the wild, Endangered a very high risk and Critically Endangered an extremely high risk (Minter et al, 2004).

Plant species data received from the South African National Biodiversity Institute (SANBI) has been classified according to the old IUCN Red Data categories of 1986. The categories used in the old Red Data classification are Extinct, Endangered, Vulnerable, Rare, Indeterminate, Insufficiently Known, Not Threatened and No Information. Species classified as Extinct are no longer known to exist in the wild, it is also possible that a species may be classified as Extinct in one country, but still survive in another. Due to the possibility that rediscoveries of a species can be made the category is sometimes referred to as Presumed Extinct (Hilton-Taylor, 1996).

Endangered taxa are taxa in danger of extinction and are unlikely to survive if the current situation continues. Vulnerable species are taxa that are likely to move into the Endangered category in the near future if the factors causing the decline continue to be present. Rare taxa are taxa with small populations that are not

classified as Endangered or Vulnerable, but are at risk as an unexpected threat may cause a critical decline in the population. Indeterminate taxa are taxa known to be in one of the four above categories, but insufficient information is available to determine which of the four categories. Insufficiently Known taxa are suspected to belong to one of the above categories, but this is not known for certain as there is a lack of information available on the species (Hilton-Taylor, 1996).

Not Threatened taxa are taxa that are no longer included in any of the threatened categories due to an increase in the population size or the discovery of more individuals of populations. No Information includes taxa without any information available. The Out of Danger category is used for taxa that have formerly been included in one of the threat categories, but are now considered relatively secure (Hilton-Taylor, 1996). The Rare category is therefore seen as similar to the Near Threatened category in the new classification and the Insufficiently Known category seems to be similar to the Data Deficient category in the new classification.

The Transvaal Nature Conservation Ordinance (no 12 of 1983) list species protected in the old Transvaal area. Species noted as protected in the tables below are protected in accordance with this Ordinance.

In the sections below, species of concern have been identified that have a possibility of occurring at the three sites.

5.3.1 Flora

IUCN listed plant species that could possibly occur on site are listed in the table below.

Table 2: Species of Concern that may possibly utilise the Sites

Species	IUCN Status (old)	Endemic	Plant Community
Acacia karroo (form)		Endemic	1, 2
Acacia sp nov		Endemic	3
Adenia wilmsii	Insufficiently Known	Near-endemic	5
Albuca sp nov		Endemic	3
Aloe burgersfortensis		Endemic	3, 4
Aloe castanea		Near-endemic	2, 3, 4, 5
Aloe pretoriensis		Near-endemic	5
Aloe reitzii var *reitzii*	Indeterminate	Near-endemic	5
Aloe sp nov		Endemic	3
Aneilema longirrhizum		Near	2
Argyrolobium wilmsii		Near	2

Species	IUCN Status (old)	Endemic	Plant Community
Argyrolobium wilmsii		Near-endemic	4
Asclepias sp nov		Endemic	2, 4
Asparagus clareae	Insufficiently Known	Near-endemic	3
Asparagus intricatus (form)		Endemic	3, 4, 5
Asparagus sekukuniensis	Insufficiently Known	Endemic	3, 4, 5
Bauhinia tomentosa (form)		Endemic	3, 4
Berkheya densifolia		Near-endemic	2
Berkheya insignis (form)		Endemic	2, 4, 5
Boscia albitrunca subsp minima		Near-endemic	3
Brachylaena ilicifolia (form)		Endemic	3, 4
Callilepis leptophylla	Threatened in other regions of southern Africa		2
Catha transvaalensis		Endemic	3, 4, 5
Chlorophyton cyperaceum		Endemic	5
Combretum petrophilum	Rare	Near-endemic	3, 4
Cyphia transvaalensis		Near-endemic	3
Cyphostemma sp nov B		Endemic	3, 5
Cyphostemma sp nov A		Endemic	2, 4, 5
Cyphostemma sp nov C		Endemic	2
Dicliptera fruticosa		Near-endemic	3
Disa rhodantha	Insufficiently Known		1
Dyschoriste perrotteti		Near-endemic	5
Elephantorrhiza praetermissa	Insufficiently Known	Endemic	2, 3, 4, 5
Euclea crispa (form)		Endemic	2, 4, 5
Euclea linearis (form)		Near-endemic	2, 3, 4
Euclea sp *nov*		Endemic	4
Eucomis autumnalis subsp *clavata*	Threatened in other regions of southern Africa		1, 2
Eucomis montana	Rare		2, 5
Euphorbia barnardii	Endangered	Endemic	4
Euphorbia enormis		Near-endemic	4
Euphorbia lydenburgensis		Near-endemic	3, 5
Euphorbia sekhukhuniensis	Rare	Endemic	5
Euphorbia sp nov		Endemic	3, 4
Gnidia caffra		Endemic	2, 3, 4, 5
Gossypium herbaceum	Threatened in other regions of southern Africa		3
Grewia vernicosa		Near-endemic	3, 4, 5
Gymnosporia sp nov B		Endemic	3, 4, 5
Helichrysum albilanatum		Near-endemic	2, 5
Helichrysum uninervium		Near-endemic	2, 4
Hemizygia sp nov		Endemic	2, 4
Hermannia antonii		Near-endemic	2
Heurnia insigniflora		Near-endemic	5
Hibiscus barnardii	Rare	Endemic	3, 4
Indigofera lydenburgensis		Near-endemic	3, 4
Ipomoea bathycolpos var *sinuatodentata*		Endemic	2, 4

Species	IUCN Status (old)	Endemic	Plant Community
Jamesbrittenia macrantha	Insufficiently Known	Endemic	2, 4
Jamesbrittenia silenoides	Threatened in other regions of southern Africa		2
Jamesbrittenia sp nov		Endemic	4
Jasminum quinatum		Near-endemic	2, 5
Jatropha latifolia var latifolia		Near-endemic	3, 4, 5
Kleinia longiflora (form)		Endemic	3, 5
Kleinia stapeliiformis	Threatened in other regions of southern Africa	Near-endemic	3, 4, 5
Ledebouria dolomiticola		Endemic	3
Leucas capensis (form)		Endemic	3, 4
Lotononis wilmsii		Near-threatened	5
Melhania randii	Insufficiently Known	Endemic	2
Mosdenia leptostachys	Insufficiently Known		3
Nuxia gracilis	Insufficiently Known	Near-endemic	1, 4
Orthosiphon fruticosus		Endemic	3, 4, 5
Orthosiphon tubiformis		Near-endemic	3
Ozoroa albicans	Insufficiently Known	Near-endemic	4
Pachycarpus transvaalensis		Near-endemic	5
Pachypodium saundersii	Threatened in other regions of southern Africa		3
Pavetta zeyheri (form)	Threatened in other regions of southern Africa	Endemic	4, 5
Pegolettia lanceolata		Near-endemic	2
Petalidium oblongifolium		Near-endemic	3, 4
Phyllanthus sp nov		Endemic	3
Plectranthus venterii		Endemic	3, 5
Plectranthus xerophilus		Near-endemic	3, 4, 5
Polygala sp nov		Endemic	2, 4
Premna mooiensis (form)		Endemic	3, 5
Protea caffra (form)		Endemic	2
Rhoicissus sekhukhuniensis		Endemic	3, 5
Rhoicissus sp nov		Endemic	2, 5
Rhus batophylla	Rare	Endemic	3, 4
Rhus engleri		Near-endemic	3, 4
Rhus keetii		Near-endemic	2, 4
Rhus rogersii	Threatened in other regions of southern Africa		2, 5
Rhus sekhukhuniensis	Rare	Endemic	4, 5
Rhus tumulicola var *meeuseana f pumila*		Near-endemic	2, 5
Rhus wilmsii	Insufficiently Known	Near-endemic	2, 4, 5
Rhynchosia nitens	Insufficiently Known		2, 5
Schizoglossum sp nov		Endemic	2
Scilla natalensis	Threatened in other regions of southern		2, 4, 5

Species	IUCN Status (old)	Endemic	Plant Community
	Africa		
Solanum incanum (form)		Endemic	3, 4, 5
Stapelia gigantea	Threatened in other regions of southern Africa		3
Stylochaeton sp nov A		Endemic	3, 4
Stylochaeton sp nov B		Endemic	5
Thesium gracilentum	Insufficiently Known		2
Thesium multiramulosum		Near-endemic	2
Tragia sp nov		Endemic	3, 4
Triaspis glaucophylla		Near-endemic	2, 3, 4, 5
Tristachya biseriata	Insufficiently Known		2
Tulbaghia sp nov		Endemic	1
Vitex obovata subsp *wilmsii*		Near-endemic	2, 3, 4, 5
Xerophyta retinervis (form)		Endemic	2, 3, 4, 5
Zantedeschia jucunda	Indeterminate	Endemic	2
Zantedeschia pentlandii	Rare	Near-endemic	2, 5

sp nov indicates new species not previously described. Reference: Siebert 2001.

A number of protected plant species occurs in the Sekhukhuneland Center of Endemism. These species are most likely to occur in areas with little disturbance:

- Six taxa of *Zantedeschia*
- 17 taxa of *Aloe*
- Four species of *Kniphofia*
- *Gloriosa superba*
- *Littonia modesta*
- *Agapanthus inapertus*
- Three species of *Eucomis*
- *Nerine rehmannii*
- *Brunsvigia radulosa*
- Three species of *Crinum*
- *Ammocharis coranica*
- Three species of *Cyrthanthus*
- Five species of *Dioscorea*
- *Schizostylis coccinea*
- Four species of *Dierama*
- *Babiana hypogea var. hypogea*
- 10 taxa of *Gladiolus*
- 35 taxa of *Orchids*
- *Tinospora fragosa*

- *Spirostachys africana*
- *Euphorbia barnardii*
- Four species of *Cussonia*
- *Erica alopecurus var alopecurus*
- *Erica cerinthoides var cerinthoides*
- *Pachypodium saundersii*
- Four species of *Brachystelma*
- Eight taxa of *Ceropegia*
- *Riocreuxia picta*
- *Tavaresia barklyi*
- Six species of *Heurnia*
- *Huerniopsis atrosanguinea*
- *Duvalia polita*
- Two species of *Stapelia*
- *Orbea tapscottii*
- *Pachycymbium keithii*
- Two species of *Orbeopsis*
- Three species of *Streptocarpus*

5.3.2 Fauna

5.3.2.1 Mammals

Only 2 Red Data mammal species may utilise the sites. The remaining species have been identified as species of concern.

Table 3: Species of concern that could possibly utilise the Sites.

Scientific Name	Common Name	IUCN Status	Protected Species	Habitat Description	Plant Community
Hippotragus niger niger	Sable Antelope	V	Protected	Savannah woodland, dependant on cover and the availability of water. Prefers open woodland with adjacent vleis or grassland with medium to high stands of grass.	All
Tragelaphus angasii	Nyala	LC	Protected	Associated with thickets in dry savannah woodland. May take the form of a closed woodland community forming a mosaic with thickets or a very open association. Riverine woodland with thickets and dry forest also provide suitable habitat for the species.	3,4,5
Redunca arundinum	Reedbuck	LC	Protected	Two essential habitat requirements, tall grass cover or herbaceous cover, preferably with some woody elements, or reed beds, and a water supply.	1,2
Alcelaphus buselaphus	Red Hartebeest	LC	Protected	Predominantly associated with open country, occurring on grassland of various types including, floodplain grassland and extensive areas of vleis, in semi-desert bush savannah and to a lesser extent in open woodland.	1,2
Oreotragus oreotragus	Klipspringer	LC	Protected	Confined to rocky habitat. Mountainous areas with krantzes, rocky hills or outcrops, extensive areas of rocky koppies, or gorges with rocky sides provide suitable habitat.	3,4,5
Pelea capreolus	Grey Reebok	LC	Protected	Associated with rocky hills, rocky mountain slopes and mountain plateau with good grass cover.	3,4,5
Raphicerus campestris	Steenbok	LC	Protected	Associated with open grassland, must provide some cover in the form of stands of tall grass, scattered bushed or scrub and the forbs which are an important part of their diet.	2,5

Scientific Name	Common Name	IUCN Status	Protected Species	Habitat Description	Plant Community
Panthera pardus	Leopard	LC	Protected	Wide habitat tolerance and generally associated with areas of rocky koppies, rocky hills, mountain ranges and forests.	3,4,5
Leptailurus serval	Serval	NT	-	Confined to areas where there is permanent water, becoming more widespread and common eastwards in the higher rainfall areas.	2,3,4
Mellivora capensis	Honey Badger	NT	-	Wide habitat tolerance	All
Poecilogale albinucha	African Weasel	DD	-	Savanna species, associated with moist grassland areas having an annual rainfall of more that 600mm.	2,3,4,5
Hipposideros caffer	Sundevall's Leaf-nosed Bat	DD	-	Generally associated with savannah woodland, their occurrence within this suggesting that the availability of surface water is an essential habitat requirement.	3,4
Myotis welwitschii	Welwitsch's Hairy Bat	NT	-	Savannah woodland specie.	3,4
Rhinolophus clivosus	Geoffroy's Horseshoe Bat	NT	-	Tolerates a wide variety of habitats	All
Crocidura fuscomurina	Tiny Musk Shrew	DD	-	Occurs on the fringes of rivers with good overhead cover	2,3,4
Crocidura hirta	Lesser Red Musk Shrew	DD	-	Catholic in their habitat requirements. Requires cover in the form of low bushes, dense under growth piles of debris and fallen logs.	2,3,4,5
Crocidura mariquensis	Swamp Musk Shrew	DD	-	Lives in moist habitats such as thick grass along river beds, in reed beds and in swamps.	1,2
Crocidura silacea	Lesser Grey-brown Musk Shrew	DD	-	Found within a wide variety of habitats, including savannah woodland and grassland.	2,3,4,5
Myosorex caffer	Dark-footed Forest Shrew	DD	-	Confined to moist, densely vegetated habitat, in parts of their distribution range they are restricted to mountainous country.	1,2,5
Myosorex various	Forest Shrew	DD	-	Prefers moist, densely vegetated habitat. Occurs in dense grass along the banks of streams.	1,2

Scientific Name	Common Name	IUCN Status	Protected Species	Habitat Description	Plant Community
Sinus lexis	Greater Dwarf Shrew	DD	-	Occurs in damp situations in riverine forest.	1, 3,4
Dismays incites	Water Rat	NT	-	Associated with wet habitats. They occur in reed beds and among semi-aquatic grasses in swampy areas or along rivers and streams, in grassy or bracken-covered areas close to water.	1,2
Graphiurus platyops	Rock Dormouse	DD	-	Confined to rocky terrain and lives in rock crevices.	3,4,5
Lemniscomys rosalia	Single-striped Mouse	DD	-	Occurs in a variety of vegetation types, but the common factor is grassland areas within these diverse vegetation types.	2
Elephantulus brachyrhynchus	Short-snouted Elephant-shrew	DD	-	Occurs in areas where there is a dense grass cover with scrub bush and scattered trees	2,5
Manis temminckii	Pangolin	V	Protected	Savanna species, catholic in their requirements, occurring in scrub, as well as, in various types of savannah woodland. Has also been observed on floodplain grassland, rocky hills, as well as, on sandveld.	3,4,5
Proteles cristatus	Aardwolf	LC	Protected	Occur in a wide variety of habitats. Occur in areas where the mean annual rainfall is between about 100mm and 600mm.	All

Reference: Friedmann Y. & Daly, B. 2004. and Skinner and Smithers. 1990.

5.3.2.2 Birds

Five species of birds classified as vulnerable may possibly utilise the site. The remaining species of concern which could also utilise the sites are classified as near threatened. According to the Transvaal Nature conservation ordinance, all bird species except for the most common species are protected.

Table 4: Bird Species of Concern that may utilise the Sites.

Scientific Name	Common Name	IUCN Status	Protected Species	Habitat Description	Plant Community
Alcedo semitorquata	Halfcollared Kingfisher	NT	Protected	Fast-flowing perennial streams, rivers and estuaries, usually with dense marginal vegetation.	All
Aquila rapax	Tawny Eagle	V	Protected	Woodland and savannah to semi-arid savannah or grassland with scattered Acacia trees.	2,3,4,5
Buphagus erythrorhynchus	Redbilled Oxpecker	NT	Protected	Savanna and Bushveld	3,4,5
Circus ranivorus	African Marsh Harrier	V	Protected	Marsh, vlei, grassland (usually near water); may hunt over grassland, cultivated lands and open savannah.	1,2
Falco biarmicus	Lanner Falcon	NT	Protected	Mountains or open areas from semi desert to woodland and agricultural land, also observed in cities.	3,4
Falco naumanni	Lesser Kestrel	V	Protected	Open grassveld, mainly on highveld, usually near towns or farms.	2
Geronticus calvus	Bald Ibis	V	Protected	High grassland, heavily grazed pastures, cultivated lands, breeds in mountainous or highly dissected country.	2
Gyps coprotheres	Cape Vulture	V	Protected	Mostly mountainous areas, or open areas with inselbergs and escarpments, less commonly in savannah or desert	2
Mirafra cheniana	Melodious Lark	NT	Protected	Open climax grassland, especially Red Grass (Themeda triandra), sometimes with rocky outcrops. Also cultivated fields of Teff (Eragrostis tef)	2,5
Sagittarius serpentarius	Secretary bird	NT	Protected	Semi desert, grassland, savannah, open woodland, farmland, mountain slopes.	2,3,4
Stephanoaetus coronatus	Crowned Eagle	NT	Protected	Dense indigenous forest, including riverine gallery forest, may range far from forest to hunt.	3,4
Vanellus melanopterus	Blackwinged Plover	NT	Protected	Open short grassland, fallow lands, pastures, airfields, playing fields, race courses.	2

Reference: Barnes. 2000 & Maclean 1993.

5.3.2.3 Reptiles

No Red Data reptiles species where identified as possibly occurring that the sites. According to the Transvaal Nature Conservation Ordinance all reptile species are protected except for the Water and Rock Leguan, and all snake species.

Table 5: Species of Concern that could possibly utilise the site.

Species name	Common name	Status	Habitat	Plant Community
Geochelone pardalis	Leopard Tortoise	Protected	Varied, including montane grassland	2
Pelusios sinuatus	Serrated Hinged Terrapin	Protected	Perennial rivers, permanent lakes and pans	1, only at the bottom dam Site B.
Scelotes mirus	Montane Dwarf Burrowing Skink	Protected	Rocky montane grassland	2
Mabuya capensis	Cape Skink	Protected	Very varied, including montane grassland	2
Mabuya homalocephala	Red-sided Skink	Protected	Varied, usually moist situations, include riverine vegetation in montane grassland	1, 2, 3, 4
Mabuya striata	Striped skink	Protected	Varied	2, 3, 4, 5
Mabuya varia	Variable Skink	Protected	Varied	2, 3, 4, 5
Nucras lalandii	De Lalande's Sandveld Lizard	Protected	Montane and temperate grassland	2
Gerrhosaurus flavigularis	Yellow-throated Plated Lizard	Protected	Varied, montane grassland and savannah	2, 3, 4, 5
Chamaesaura aenea	Transvaal Grass Lizard	Protected	Grassland on mountain slopes and plateaus	2
Cordylus vittifer	Transvaal Girdled Lizard	Protected	Rock outcrops in grassland	2, 5
Agama atra	Southern Rock Agama	Protected	Varied	1, 2, 3, 4, 5
Bradypadion transvaalense	Transvaal Dwarf Chameleon	Protected	Wet forest of escarpment kloofs	1, 3, 4
Chameleon dilepis	Flap-neck Chameleon	Protected	Savanna woodland	3, 4
Hemidactylus mabouia	Moreau's Tropical House Gecko	Protected	Varied, including wet and dry savannah	3, 4
Lygodactylus nigropunctatus	Black-spotted Dwarf Gecko	Protected	Wet and dry savannah and subtropical thicket	3, 4
Lygodactylus ocellatus	Spotted Dwarf Gecko	Protected	Rocky outcrops above 1 500m	2, 5

Reference: Branch. 1998.

5.3.2.4 Amphibians

No Red Data or Protected species where identified that could possibly utilise the sites.

5.3.2.5 Invertebrates

The invertebrate species that are protected under the Transvaal Nature Conservation Ordinance, which could potentially occur on the sites, are listed below in the table below.

Table 6: Invertebrate species that may possibly utilise the Sites.

Species name	Common name	Status	Habitat	Plant Community
Charaxes candiope	Green-veined Emperor	Protected	Forest edges, flatlands, hillsides. Foodplant: Croton species	2, 3
Charaxes jasius saturnus	Foxy Emperor	Protected	Hill tops, flatlands, hillsides, parks. Foodplants: *Afzelia quanzensis, Scotia brachypetala, Burkea africana, Bauhinia galpinii, Colophospermum mopane, Xanthocercis zambesiaca, Xeroderris stuhlmannii, Guibourtia conjugate, Maytenus senegalensis, Catha edulis, Croton sp*	2, 3, 4
Charaxes druceanus	Silver-barred Emperor	Protected	Flatlands, mountains, hillsides. Foodplants: *Myrtaceae,* including *Syzygium cordatum* and *S. guineense*	3
Charaxes xiphares	Forest King Emperor	Protected	Mountains, hillsides. Foodplants: *Cryptocarya woodii, Scutia myrtina, Rhamnus prinoides, Chaetachme aristata*	3
Ceratogyrus species	Horned Baboon Spiders	Protected	Widespread throughout southern Africa	2,3,4, 5
Harpactira species	Common Baboon Spiders	Protected	Widespread throughout southern Africa	2,3,4, 5
Pterinochilus species	Golden-brown Baboon Spiders	Protected	Widespread throughout southern Africa	2,3,4, 5

Reference: Woodhall. 2005 & Leroy, A & J. 2003.

5.4 SITE A

5.4.1 Upper Dam

Three vegetation communities (2, 4 and 5) occur at this site, of which community 4 is dominant, with some patches of communities 2 and 5. The site is still intact, with very little disturbance.

5.4.2 Lower Dam

Four of the five vegetation communities occur here (1, 2, 3, 4) (see Plate 5). The dominant vegetation communities are community 2 and 3. Only a small patch of community 4 is present on the site and the riverine areas are represented by community 1. Community 2 is very important due to the high number of species of concern that may utilise this community. The site has been disturbed in some areas due to the construction of electricity lines and other infrastructure. The disturbance is however limited to these areas and therefore localised.

Plate 5: Panorama of Site A Lower Dam

	Species of Concern					
Community	***Flora**	**Mammals**	**Birds**	**Reptiles**	**Amphibians**	**Invertebrates**
Upper						
2	43	18	9	12	0	5
4	51	17	6	9	0	7
5	45	16	4	6	0	3
Lower						
1	5	11	2	4	0	0
2	43	18	9	12	0	5
3	50	17	6	9	0	7
4	51	17	6	9	0	7
Sensitivity	**High**					

*Protected species not included

This community has a high sensitivity due to the high biodiversity and number of species of concern that may utilise the site.

5.5 SITE B

5.5.1 Upper Dam

Only two vegetation communities occur at this site (1 and 2) (see Plate 6). Community 2 is the dominant community and community 1 is represented in the drainage area. The site is still fairly intact with some ruins occurring on the edge of the site.

Plate 6: Site B Upper

5.5.2 Lower Dam

The dominant community at all options at this site is community 3, with community 1 representing the perennial stream on site. The site is still intact, with very little disturbance.

	Species of Concern					
Community	***Flora**	**Mammals**	**Birds**	**Reptiles**	**Amphibians**	**Invertebrates**
Upper						
1	5	11	2	4	0	0
2	43	18	9	12	0	5
Lower						
1	5	11	2	4	0	0
3	50	17	6	9	0	7
Sensitivity	**High**					

*Protected species not included

The site has a high sensitivity due to the low level of disturbance and the presence of a perennial drainage line.

5.6 SITE C

5.6.1 Upper Dam

The site is highly disturbed (see Plate 7). Maize (*Zea mays*) is planted on a large portion of the site and the rest of the site is old cultivated fields colonised by *Tagetus minuta*, *Eragrostis* sp., *Pogonarthria squarrosa*, *Hyparrhenia* sp., *Bidens* sp., as well as various other grass and forb species. Several of these species are indicators of disturbance.

Plate 7: Site C Upper Dam

	Species of Concern					
Community	***Flora**	**Mammals**	**Birds**	**Reptiles**	**Amphibians**	**Invertebrates**
Upper						
2	43	18	9	12	0	5
Sensitivity	**Low**					

*Protected species not included

The site has a low sensitivity due to the intense disturbance at the site.

5.7 POTENTIAL HIGH RISK FLAW

The general location is located within a Sekhukhuneland Centre of Endemism and the number of species of concern is therefore high. Although there might be alternative habitat available for the species, a more detailed study would be necessary. Some of the species of concern have only been discovered recently and therefore very little is known about them. The

specific habitat requirements of some of the species are also unknown. The sites should therefore be investigated in detail prior to decreasing the risk of loss of sensitive species and habitat.

After the screening process it was determined that Site C is the least ecologically sensitive, therefore this site would be preferable from an environmental perspective for the pumped storage scheme upper reservoir.

Site A is slightly disturbed, but is still fairly intact and offers habitat to a high number of species. All the communities are present at the two locations for the dams at Site A. Habitat diversity are very high at this site.

Site B is the most intact habitat. A large number of species of concern occurs in these habitats, however the richness is lower than that possibly occurring at site A due to the lower habitat diversity.

5.8 FINAL SUMMARY

Location	Rating
Site A Option 1	2
Site A Option 2	2
Site A Option 3	3
Site B Option 1	2
Site B Option 5	2
Site B Option 7	2
Site C Option 1	4

6 RIVERINE ECOLOGY

6.1 SITE A AND B

Riverine ecology was considered for screening at the lower reservoirs (all options) comprising site A and B. The upper reservoirs do not influence riverine ecosystems. The lower reservoir for Site C is the proposed De Hoop Dam.

The assessment of riverine ecology that could be affected by the lower dam at Sites A and B is based on the findings of the Olifants River Water Resources Development Project Environmental Assessment Specialist Study on Aquatic Ecology, conducted by R Palmer, 2004.

The small tributary of the Steelpoort River which will be affected by the proposed dam at Site A is similar in nature to the Klip River which will be inundated by the construction of the proposed De Hoop Dam. The information obtained in the proposed De Hoop EIA for the Klip River is thus relevant to this environmental screening.

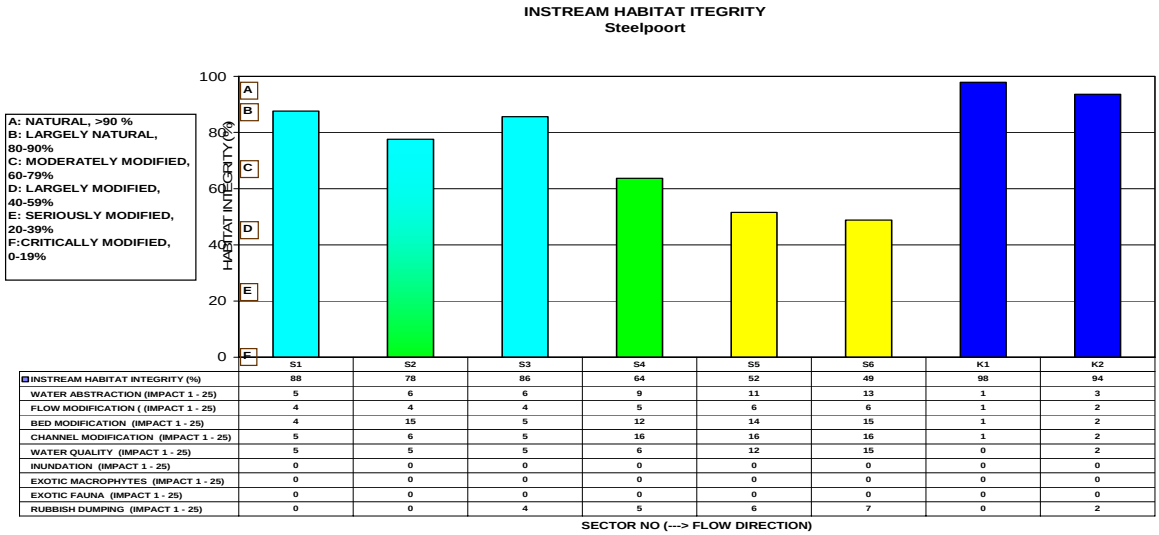
Plate 8: Klip River streambed (left) tributary at Site A (right)

6.2 RIVERINE HABITAT

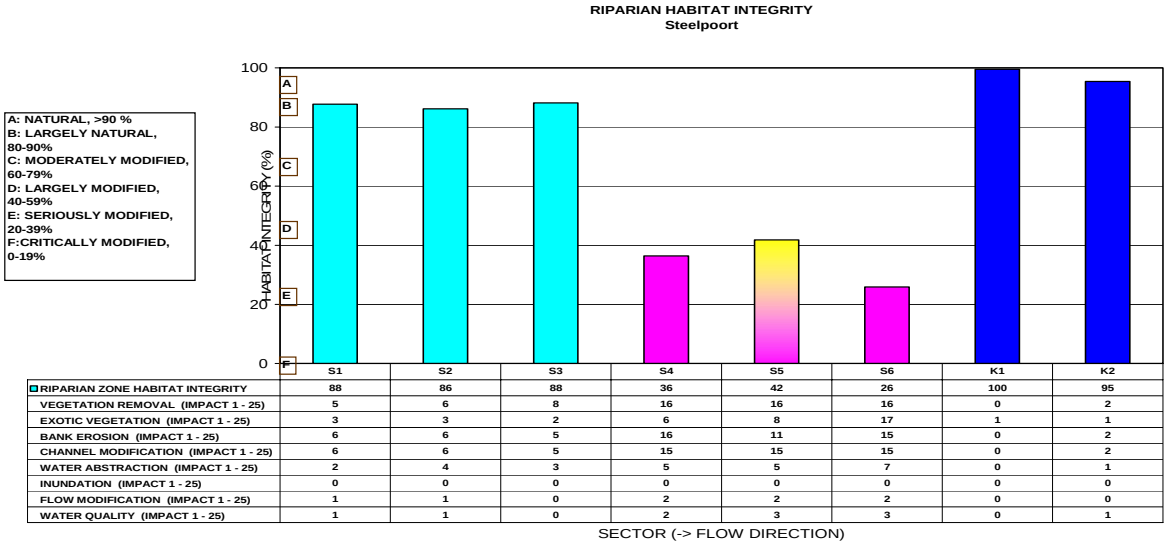
The habitat of the Klip River contains some well-developed small riffles and runs with larger rocks and backwaters that provide good cover. The site also supports well developed marginal vegetation that provides good cover for fish. Site A Tributary is expected to have the same characteristics.

Habitat integrity for both in-stream and riparian components in the vicinity of the Klip River tributary is considered to be Natural (Category A) (Figure 2).

Discussions with farmers at Site A identified that during high flood events, massive boulders roll down the river bed which has led to significant alteration of the channel morphology and has resulted in the destruction of the road bridge below the planned option A3 location. It is expected that a more detailed examination of this phenomenon would be required as part of the detailed engineering and environmental studies.



	S1	S2	S3	S4	S5	S6	K1	K2
INSTREAM HABITAT INTEGRITY (%)	88	78	86	64	52	49	98	94
WATER ABSTRACTION (IMPACT 1 - 25)	5	6	6	9	11	13	1	3
FLOW MODIFICATION (IMPACT 1 - 25)	4	4	4	5	6	6	1	2
BED MODIFICATION (IMPACT 1 - 25)	4	15	5	12	14	15	1	2
CHANNEL MODIFICATION (IMPACT 1 - 25)	5	6	5	16	16	16	1	2
WATER QUALITY (IMPACT 1 - 25)	5	5	5	6	12	15	0	2
INUNDATION (IMPACT 1 - 25)	0	0	0	0	0	0	0	0
EXOTIC MACROPHYTES (IMPACT 1 - 25)	0	0	0	0	0	0	0	0
EXOTIC FAUNA (IMPACT 1 - 25)	0	0	0	0	0	0	0	0
RUBBISH DUMPING (IMPACT 1 - 25)	0	0	4	5	6	7	0	2



	S1	S2	S3	S4	S5	S6	K1	K2
RIPARIAN ZONE HABITAT INTEGRITY	88	86	88	36	42	26	100	95
VEGETATION REMOVAL (IMPACT 1 - 25)	5	6	8	16	16	16	0	2
EXOTIC VEGETATION (IMPACT 1 - 25)	3	3	2	6	8	17	1	1
BANK EROSION (IMPACT 1 - 25)	6	6	5	16	11	15	0	2
CHANNEL MODIFICATION (IMPACT 1 - 25)	6	6	5	15	15	15	0	2
WATER ABSTRACTION (IMPACT 1 - 25)	2	4	3	5	5	7	0	1
INUNDATION (IMPACT 1 - 25)	0	0	0	0	0	0	0	0
FLOW MODIFICATION (IMPACT 1 - 25)	1	1	0	2	2	2	0	0
WATER QUALITY (IMPACT 1 - 25)	1	1	0	2	3	3	0	1

Figure 2. Habitat integrity at various sites in the vicinity of the proposed De Hoop Dam, assessed in August 2004 (Site K2 is the reference site for Site A Tributary).

6.2.1 Invertebrates

The only invertebrate taxon which is sensitive to water pollution and needs flowing water was the stonefly *Neoperla spio*. This species was present in the Klip River. This indicates that the Klip River provides an important refuge area for sensitive taxa.

6.2.2 Fish Community

Eleven of 15 expected fish species were recorded during the survey at the Klip River. A total of 131 specimens were collected and the catch per unit effort was 3.1 fish/minute, which is higher than those recorded in the Steelpoort River. The presence of an additional two species is related to available habitat conditions present at the site and being in a relatively well conserved tributary. Analysing the expected and observed fish diversity in terms of habitat preferences, it is evident that that all habitat preference categories were less impacted at this site than at any of the other sites in the Steelpoort River. The Klip River most likely serves as refuge for highly sensitive species such as *Opsaridium peringueyi* and *Amphilius uranoscopus* from where they can repopulate the Steelpoort River during favourable conditions. This site is also potentially one of the few sites that may still support some specimens of *Barbus lineomaculatus* that has not been collected in this river since 2000. Overall, this site in terms of fish was classified as Slightly Impaired (Category B).

A variety of small barbs such as *Barbus lineomaculatus, Barbus paludinosus, B. trimaculatus* and *B. unitaeniatus* have been recorded from this area and they need access to inundated marginal vegetation during summer to spawn. The maintenance of shallow, slow-flowing vegetated backwaters as nursery areas, during the breeding season is also essential.

The proposed dam is expected to inundate the Site A Tributary. This is certain to eliminate all flow-dependent fish species, particularly the Barred minnow (*Opsaridium peringueyi*) and the Shortspine rock catlet (*Chiloglanis pretoriae*). The Barred minnow listed in the Red Data book for fish as Rare – Indeterminate (Skelton 1987). These flow-dependent species are currently found in the lower sections of Klip River. There is also a risk that alien fish species, such as black bass, which are currently absent from this stream, may colonise the stream.

6.2.3 Birds

Inundation of the Steelpoort River will be highly detrimental to a number of riverine bird species, the most noteworthy of which is the Half-collared

Kingfisher, which is listed in the Red Data book for birds as Near Threatened, with populations declining (Barnes 2000). Other riverine bird species that are likely to be detrimentally impacted by the proposed dams include the African marsh warbler, African sedge warbler, Red faced cisticola, Common waxbill, Wattled plover, Burchell's coucal and African black duck.

However, a wide range of aquatic species are likely to benefit from the proposed impoundments. At least 64 species of birds that are commonly associated with water or wetlands have been recorded in the vicinity of the proposed De Hoop Dam. It is likely that many of these bird species will benefit from the impoundments and that the remainder will be very little affected by the change. Noteworthy species that are likely to benefit from the impoundment include the Pinkbacked pelican (Rare), African spoonbill (Uncommon) and White breasted cormorant.

6.2.4 Mammals and Reptiles

It is possible that crocodiles will inhabit the new impoundments, as they occur in the nearby Flag Boshielo Dam on the Olifants River and may migrate to the proposed De Hoop Dam, at a similar altitude. Crocodiles were also recently recorded about 5km upstream of Steelpoort Bridge. Crocodiles are listed as Vulnerable in the South African Red Data book of reptiles and amphibians (Branch 1988). The only other aquatic reptile listed in the Red Data book that is expected to occur in the area is the Water monitor (Leguan), also listed as Vulnerable.

At least 23 species of mammals that are commonly associated with water or wetlands are expected to occur or have occurred in the vicinity of the proposed De Hoop Dam and thus could be expected at Site A Lower Dam. Of these, only three species are commonly associated with water or wetlands: clawless otter, spotted necked otter and water mongoose. It is likely that water mongooses, which are common throughout South Africa, will benefit from the higher water level. It is possible that water mongoose could carry rabies. There are presently no known hippos in the area and they are not expected to colonise the dam. However, hippos are known to

travel long distances, particularly after floods, and there is a small chance that they could establish in the impoundments.

6.2.5 Eutrophication and Emission of Greenhouse Gases

The conversion of a large area from a terrestrial to an aquatic ecosystem leads to the decomposition of vegetation and subsequent release of nutrients and emissions of significant quantities of greenhouse gasses. Elevated nutrients can lead to the development of blue-green algae, such as Microcystis and Anabaena, which can be toxic.

The main gasses of concern are carbon dioxide, which will be released under aerobic conditions within the epilimnion of the new impoundments, and methane, which will be released under anaerobic conditions within the hypolimnion. Both gases have greenhouse effects, but methane is much more potent. Globally it is estimated that impoundments contribute between 1 and 28% towards global warming and climate change (World Commission on Dams 2000). Current understanding is that shallow, warm tropical dams are more likely to contribute greenhouse gasses than deep cold boreal dams (World Commission on Dams 2000). The proposed dam basins contain significant numbers of large *Acacia galpinii* and *Combretum* trees that characterise the riparian zone. The vegetation survey estimated that there are in the order of 10 000 *Acacia galpinii* trees that will be inundated. The density of woody biomass in the proposed De Hoop Dam basin was estimated at 432 and 129 tonnes per ha at two sites, although there were some areas that were devoid of trees. The decomposition of trees is likely to take place under mainly under anaerobic conditions and this is likely to contribute significantly to increased levels of greenhouse gasses and nutrients.

6.2.6 Increased Bilharzia

Bilharzia snails were not found during the baseline survey in August 2004, and a detailed survey of aquatic snail distribution in the Olifants River Catchment conducted between 1958 and 1970 failed to find urinary bilharzia snails (*Bulinus* spp.) in the Steelpoort River Catchment (de Kock et al 1983). However, intermediate host snails for rectal bilharzia (*Biomphalaria pfeifferi*),

were recorded from two tributary streams in the vicinity of the proposed dam (de Kock et al 1983).

These snails are usually not found at altitudes above 914 m (Schutte and Frank 1964). The proposed dams, with a FSL of 1000 m, are therefore in excess of the altitudinal distribution range for rectal bilharzia

6.2.7 Disruption of Fish Migration

The proposed dams are certain to create a permanent barrier to upstream fish migration and isolate the river fish population into two distinct populations, with consequent long-term implications for genetic diversity and vigour. Species that will be most affected by this barrier to migration include Largescale yellowfish *(Labeobarbus marequensis)* and Labeo *(Labeo molybdinus*).

6.3 SITE C

The upper reservoirs are located in the upper reaches of the catchment within a drainage line and not within a clearly defined river system.

6.4 FINAL SUMMARY

Location	Rating
Site A Option 1	2
Site A Option 2	2
Site A Option 3	2
Site B Option 1	2
Site B Option 5	2
Site B Option 7	2
Site C Option 1	4

7 WATER QUALITY

The State of the Rivers report for the Olifants River (2001) describes the ecological state of the Steelpoort River as fair to unacceptable. Land-use practices such as overgrazing has lead to erosion, which causes high silt levels in the river. Runoff from mines and other activities in the area also contributes to reduced water quality.

The pumped storage scheme must be viewed as an inter-basin transfer scheme and while the effects on the three upper dams will be similar, a

more detailed assessment is required to determine the implications of catchment transfer impacts.

Various water quality studies undertaken along the Steelpoort River are reviewed and the main water quality concerns addressed at each proposed site location.

7.1 SITE A

An EIA undertaken for Site A in 1999 assessed the water quality situation of the Steelpoort River. The DWAF monitoring station on the Steelpoort River on Buffelskloof was used to assess the water quality in the River downstream of the position of the proposed dam location. Data obtained for the period 1987 to 1999 found the water to be of relatively good quality, although problems with high salinity were observed (Wates, Meiring and Barnard, 1999).

In the feasibility study of the Steelpoort Pumped Storage Scheme (Louwinger et al., 2000), water from the stream at the upper reservoir site and the Steelpoort River was found to meet the SABS standard for drinking water.

It is therefore expected that since the water quality of the river is good, the relative changes that may occur as a result of dam construction would be internal. Such water quality impacts may be the result of:

- The formation of a chemocline after filling as inorganic particles are dissolved into the water and the breakdown of organic matter (vegetation) has a similar effect;
- The formation of a hypolimnion (depending on the depth of the dam) leading to an anaerobic bottom layer in the layer; and
- The development of elevated levels of nutrient enrichment through the process of vegetative breakdown. This is a reduced risk as the breakdown process happens over time and there are no external sources of nutrient enrichment which would lead to eutrophication. It is expected that the dam would be oligotrophic.

The implications on water quality regarding bush clearing and pure flooding would need to be considered during later phases of the project and is not considered here because:

- There is no available water quality data for the river; and
- The impacts would be similar for all sites.

7.2 SITE B

No studies have been carried out regarding the water quality at the proposed site. However, it is anticipated that water quality issues addressed by various studies undertaken for Site A and C will be similar for Site B Option 7 due to its location along the Steelpoort River.

A similar impact to Site A is expected at the Option B5 site but with one difference. Development plans for the area immediately upstream of the dam include a conference centre. The impact of the conference centre could be significant on the quality of the water in the dam:

- Increased paved areas accelerate the potential for oil contamination of the dam;
- Increased landscaping and maintenance could increase the level of suspended sediment in the dam;
- The additional fertilizers in garden maintenance could increase the level of nutrients in the system; and
- The treatment of waste water from the centre may add a nutrient load to the dam resulting in eutrophic conditions.

While the assessment of Site B is considering the impact of the dam on the environment, it is important to take into account future development plans for the catchment. The potential increase in turbidity could affect the lifespan of the pumps. Additionally, the potential increase in eutrophication will increase the risk for additional enrichment and associated impacts not only in the river section downstream of the dam and ultimately the proposed De Hoop Dam, but also the upper reservoir and its downstream catchment which is relatively unaffected at present.

7.3 SITE C

Various studies (Palmer, 2001; Palmer and Rossouw, 2001; Claassen et al., 2004) have been undertaken regarding the water quality situation of Steelpoort River due to the proposed development at Site C.

Previous studies by Palmer (2001) and Palmer and Rossouw (2001) indicated that the Steelpoort River was in a fair state for water quality (Class C). Significant increases in total dissolved salts in the downstream parts of the river were observed. This can be attributed to mining activities, irrigation and land-use practices in the area. The increase in total dissolved salts was found to be highly seasonal with high concentrations recorded during the low flow months. Nutrients were slightly elevated as a result of treated domestic effluent from Burgesfort (Palmer and Rossouw, 2001).

As part of an EIA in 2004, a water quality assessment was undertaken to identify the expected water quality impacts associated with the development of the proposed De Hoop Dam. The potential water quality impact was assessed during each developmental phase of the dam i.e. construction, filling and operational phase (Claassen et al., 2004).

During the construction phase, water quality will be influenced by increased sediment levels and water contamination could potentially occur due to the storage of chemicals on-site. However, the impact will be for a short duration and will be limited to the construction period. Within the dam basin, contamination may occur due to human activities or due to eutrophication. Both these contaminants will have a serious impact on the water quality, should appropriate mitigation measures not be used. Impacts associated with the filling phase are associated with a reduction in flow and changes in the water quality though alterations in the sediment load, turbidity, temperature, oxygen, nutrients, salts, toxicants and introduced species. The impact will be continuous and will remain over the life time of the dam. Other impacts such as changes in temperature, oxygen, turbidity and sedimentation will also occur over the life time of the dam (Claassen et al., 2004).

Overall, the residual impact is expected to be within the compliance requirements of the ecological Reserve and not influence existing water users if reasonable mitigation measures are employed during the construction and operational phase of the dam (Claassen et al., 2004).

As part of the same EIA, Donohue (2004) addressed health impacts associated with the proposed De Hoop Dam development. Potential water quality impacts were also addressed in the document, with particular emphasis on human health. Water quality concerns are associated with faecal contamination, eutrophication, organic chemicals and heavy metals contamination. Diseases such as bilharzias are anticipated to increase as a result of the development. Dam usage for recreation and agriculture should be limited to maintain water quality (Donohue, 2004).

The water quality assessment for the proposed De Hoop Dam also considered that the resultant water quality in the dam would be corrosive (implications for construction) and turbid (implications for lifespan of pumps). Additionally, has indicated that off-channel storage schemes may offer a reduced risk for siltation as filling from the river typically happens on a continuous basis during base flow conditions. This reduces the potential impact on turbidity within the impoundment.

The upper dam water quality will reflect the quality of the proposed De Hoop Dam.

7.4 FINAL SUMMARY

Location	Rating
Site A Option 1	4
Site A Option 2	4
Site A Option 3	4
Site B Option 1	3
Site B Option 5	4
Site B Option 7	3
Site C Option 1	2

8 HYDROLOGY

The environmental hydrological implications for sites A and B are similar for all options. Site C lower reservoir is not considered since this will be created by the proposed De Hoop Dam.

8.1 SITE A AND B

At the lower reservoir sites (Options A3, B1, B5, B7), the damming up of the small tributaries is expected to negatively impact on the current hydrological regime and also future hydrological functioning. One of the main impacts of impoundments is that they change the timing, size and frequency of flow events in the river downstream. Altered flow patterns lead to changes in sediment dynamics and habitat availability. Habitat availability affects species composition and abundance and this may affect resource utilization patterns, with consequent (and usually negative) impacts on social and economic structures. A small number of people downstream of the proposed A3 reservoir currently utilise the river for washing, potable water and possibly irrigation of small gardens. Additionally, the continued functioning of the riverine ecology below the reservoirs needs to be assessed in detail.

The environmental implications of changes in flow at Option A1 were assessed as part of the environmental impact assessment completed in 2004 and the results indicated that due to the current altered flow patterns, the proposed reservoir will have a profound detrimental influence on aquatic ecosystems in the Steelpoort River downstream of the reservoir, particularly if the Ecological Water Reserve is not released.

The upper reservoir site is not considered to be restrictive in terms of hydrological impedance.

8.2 SITE C

Site C will have limited impact on the hydrology of the area as the upper reservoir is situated in the uppermost portion of the catchment on a drainage line.

8.3 FINAL SUMMARY

Location	Rating
Site A Option 1	2
Site A Option 2	2
Site A Option 3	3
Site B Option 1	3
Site B Option 5	4
Site B Option 7	3
Site C Option 1	4

9 AGRICULTURAL POTENTIAL

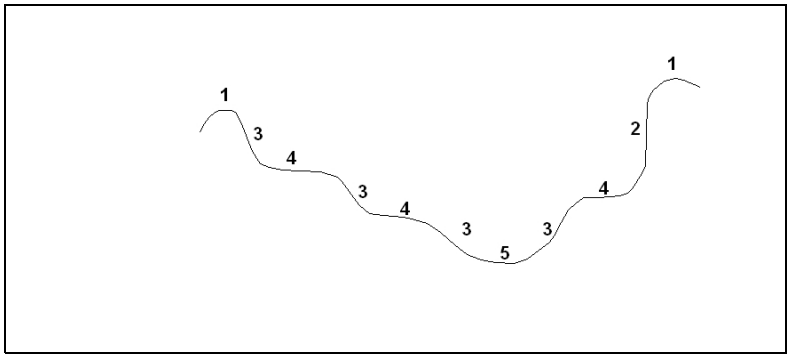
9.1 TERRAIN FORM

9.1.1 Terrain type

The terrain type has two parts, slope and length. The slope is indicated by
A: more than 80% of the area has slopes less than 8%
B: 50 – 80% of the area has slopes less than 8%
C: 20 – 50% of the area has slopes less than 8%
D: less than 20% of the area has slopes less than 8%
and the length of the slope is divided into six classes:
Class 1: 0 – 30 m
Class 2: 30 – 90 m
Class 3: 90 – 150 m
Class 4: 150 – 300 m
Class 5: 300 – 900 m
Class 6: >900 m

9.1.2 Terrain Unit

The terrain unit, a homogenous portion of land in terms of form and slope, was identified for all the soil forms identified. Five terrain units are used and each soil form was limited to one of these terrain units. The terrain units are the crest (1), scarp (2), midslope (3), footslope (4) and valley bottom or flood plain (4).



The following described for each terrain unit:

Range in percentage slope

Range in length (m)

Shape

And area in ha

Site A – Upper Dam

Terrain Unit	Crest	Scarp	Midslope	Footslope	Valley Bottom
Percentage of land type	15	5	70	5	5
Slope (%)	8-15	100+	15-100	6-15	6-100
Slope Shape	Convex	Straight	Convex/Concave	Concave	Concave

Terrain Type: D4

Site A - Lower Dams

Terrain Unit	Midslope	Valley Bottom
Percentage of land type	95	5
Slope (%)	6-20	3-20
Slope Shape	straight/concave	concave

Terrain Type: D3

Site B – Upper Dam

Terrain Unit	Crest	Midslope	Footslope	Valley Bottom
Percentage of land type	40	55	3	2
Slope (%)	0-8	6-15	5-8	1-4
Slope Shape	Convex	Convex/Concave	Concave	Concave

Terrain Type: A3

Site B – Lower Dams

Terrain Unit	Midslope	Valley Bottom
Percentage of land type	95	5
Slope (%)	5-20	2-10
Slope Shape	Concave/Convex	Concave

Terrain Type: A3

Site C – Upper Dam

No data is available for Site C. Therefore data from the surrounding areas that are similar to Site C was used.

Terrain Unit	Midslope
Percentage of land type	100
Slope (%)	12-100
Slope Shape	Concave/Convex

Terrain type: C4 (Inaccessible for Field work)

9.1.3 Geology

The rocks in the area fall within the Bushveld Igneous Complex and comprise felsic rocks of the Rashoop Granophyre Suite overlying the mafic rocks of the Upper and Main Zones of the Rustenburg Layered Suite. The high plateau is underlain by granophyre in the south of the area and by mixed granite and granophyre in the north. These felsic rocks are several hundred metres thick and form the steep scarp slopes. Below the bottom of the scarp at the base of the felsic rocks is a leptite formation approximately 250m thick, dipping approximately 10 degrees westwards into the slope. This is in turn underlain by diorite beneath the pediment slope, grading into olivine-bearing diorite and gabbro beneath the valley floor. These mafic rocks underlying the leptite formation contain bands of anorthosite and magnetite, and all of the horizons dip around 10 degrees towards the west.

All of the rocks discussed above have been intruded by dolerite/lamprophyre dykes, generally trending northeast (roughly parallel to the Steelpoort fault) and west of northwest (roughly perpendicular to the fault).

Table 7. Geological information on sites (Phase 1: Site selection study. Draft report on Desktop geotechnical study)

Site	Geology	Location	Notes
A: upper	Granophyre of the Rashoop Suite; leptite, diorite of the Rustenburg Layered Suite	Top of escarpment	Leakage through bedrock expected to be minimal
A: lower	Ferrogabbro and ferrodiorite in the Upper zone, Rustenburg Layered Suite.	Pediment slope across small stream	Colluvium (boulders and sandy gravel) overlying bedrock. Sand and overburden could be used for construction of subgrade and layer works for access roads
B: upper	Granophyre of the Rashoop Suite; leptite, diorite of the Rustenburg Layered Suite and Granite of the Lebowa Suite.	Top of escarpment	Leakage through bedrock expected to be minimal
B: lower	Ferrogabbro and ferrodiorite in the Upper zone, Rustenburg Layered Suite.	Pediment slope across small stream	Colluvium (boulders and sandy gravel) overlying bedrock. Sand and overburden could be used for construction of subgrade and layer works for access roads
C: upper	Granophyre of the Rashoop Suite; leptite, diorite of the Rustenburg Layered Suite and Granite of the Lebowa Suite.	Top of escarpment	Leakage through bedrock expected to be minimal Up to 2m of sandy soil and gravel overburden expected.
C: lower	Ferrogabbro and ferrodiorite in the Upper zone, Rustenburg Layered Suite.	Pediment slope across small stream	Colluvium (boulders and sandy gravel) overlying bedrock. Sand and overburden could be used for construction of subgrade and layer works for access roads

Reference: Soil and Irrigation Research Institute, 1987.

9.1.4 Soil types

Land types have been denoted for area with a uniform terrain form, soil pattern and climate. The different land types differ in one of these three characteristics. The dominant land types recorded for this area is Ba, Bc and Ib.

The B land types are plinth catena from the upland duplex and margalitic soils. These soils are typical wetland soils. These soils may have a thick organic layer (such as peat), be grey in colour or have mottles indicating a

fluctuating water table. The soil forms present in these soil types are therefore mostly wetland soils including, but not limited to, Rensburg, Willowbrook, Katspruit and Champagne soil forms. The soil forms can only be classified as land type B if these soils are the dominant soil forms. Some other soils may however be patchily distributed in the area.

The Ib land type indicates areas with exposed rock on the soil surface. The rock should cover 60 – 80% of the area. The underlain soil may qualify the area to be classified into a different land type, if not for the rockiness.

The ploughing capability is defined as:
MB0 – no mechanical limitations
MB1 – many stones, but ploughable
MB2 – large stones and boulders, unploughable
MB3 – very shallow soils on rock
MB4 – lack of soil

Table 8. Land types present on the site

Site	Land Type	Soil Description	Plough Capability	Additional Notes
Site A – Upper Dam	Ib19	Rock areas with miscellaneous soils	MBO, MB1: 2% MB2-MB4: 98%	High concentrations of heavy metals, as well as magnesium and calcium
Site A – Lower Dam	Ba16	Dystrophic and/or mesotrophic: red soils widespread	MBO, MB1: 42% MB2-MB4: 58%	
Site B – Upper Dam	Ib23	Rock areas with miscellaneous soils	MBO, MB1: 14% MB2-MB4: 86%	
Site B – Lower Dam	Bc7	Eutrophic; red soils widespread	MBO, MB1: 60% MB2-MB4: 40%	
Site C – Upper Dam	Ib38	Rock areas with miscellaneous soils	MBO, MB1: 0% MB2-MB4: 100%	

9.2 AGRICULTURAL POTENTIAL

Site A lower dam is located within the Ba land type and Site B lower dam in the Bc land type. Both of these land types have wetland soils, the wetland soils do however, occur in conjunction with red soils. Red soils in general are good agricultural soil. Portions of these land types may not be suitable

for ploughing. It is expected that cultivation activities at these sites may be successful. It should however be taken into account that, according to the Conservation of Agricultural Resources Act (Act No 43 of 1983) (CARA), no agricultural activities may take place within 10 m horizontal of a drainage line or wetland. These sites therefore have high agricultural potential.

Site A upper dam and Site B upper dam both occur within the Ib land type, and we assume that Site C also falls within this land type. Site C is however less rocky, probably due to small scale variation in the land type.

Site A upper dam is very rocky and may contain metals in the soil. The site is therefore unsuitable for agricultural activities. Thus the agricultural potential is low.

Site B upper dam has large boulders and is very rocky, thereby prohibiting ploughing of the soil. Some drainage areas also occur on the site and are protected by CARA. This site is not suitable for agriculture, and the agricultural potential is therefore low.

Site C is currently patchily utilised for agricultural activities. No large boulders are evident at the site. Portions of the area are currently being cultivated but some portions that have been cultivated in the past are not under cultivation any more and are colonised by pioneer species. The reason for this may be that these portions do not yield a good crop. Although the site is suitable for agriculture it is not prime agricultural land. Thus the agricultural potential is medium.

9.3 FINAL SUMMARY

Location	Rating
Site A Option 1	4
Site A Option 2	4
Site A Option 3	4
Site B Option 1	3
Site B Option 5	4
Site B Option 7	4
Site C Option 1	2

10 DISPLACEMENT OF PERSONS

10.1 SITE A

A small number of people may be displaced in the current scheme. One weekend farm house and one worker dwelling will be affected by Option A3 and occupants may have to be relocated.

10.2 SITE B

No persons will be displaced at the upper reservoir. There are a small number of dwellings at the lower reservoir option 5 and these occupants will be displaced.

10.3 SITE C

No people are expected to be displaced at the upper site.

10.4 FINAL SUMMARY

Location	Rating
Site A Option 1	2
Site A Option 2	2
Site A Option 3	4
Site B Option 1	4
Site B Option 5	2
Site B Option 7	3
Site C Option 1	4

11 HERITAGE

What is presented below is simply a short overview of past human occupation in the region. It is done in order for the developer to gain insight into the complexity of the identified cultural resources.

11.1 STONE AGE (2 000 000 YEARS AGO TO AD 200)

Habitation of the larger geographical area took place since Stone Age times. One of the more important sites, known as Bushman Rock Shelter, is located at Echo Caves north of Ohrigstad. Early humans lived here, discontinuously, for thousands of years, from the Early Stone Age (2 million to 150 000 years ago), through what is known as the Middle Stone Age

(150 000 to 30 000 years ago), and well into the Late Stone Age (30 000 to 1 800 years ago).

That Stone Age people occupied the Steelpoort valley is confirmed by the occurrence of stone tools dating to the Early, Middle and Late Stone Age. The majority of finds are classified as isolated surface occurrences, and mostly date to the Middle Stone Age. Consequently, such finds are judged to have a low significance and they require no mitigation measures.

Very few sites containing rock art are known from the larger geographical region, but none were identified in the survey area.

11.2 IRON AGE (AD 200 – AD 1830)

Iron Age people moved into southern Africa by c. AD 200, entering the area either by moving down the coastal plains, or by using a more central route. It seems more likely that the first option was what brought people into the study area. From the coast they followed the various rivers inland. Being cultivators, they preferred the rich alluvial soils to settle on. One of the earliest dated sites is located near Tzaneen (Silver Leaves).

Iron Age occupation of the study area seems to have taken place on a significant scale and at least three different phases of occupation have been identified.

Sites dating to the Early Iron Age (AD 200 to AD 1000) were identified. Preliminary identification of the pottery indicates that it belong to the Doornkop phase of the Early Iron Age, and should have a date of between AD 600 – 900. These are the same group of people that produced the remarkable clay masks found near Lydenburg in the 1960s.

These settlements seem to have been followed at a slightly later date by settlements linked to the Eiland Phase of the EIA (c. AD 1000).

Early Iron Age sites are our only source of evidence for the occupation of the area by early farming communities. As such these sites are important

and they are viewed to have medium significance, which implies that they would require mitigation measures.

The last period of pre-colonial occupation consisted of Pedi-related and Swazi-speaking and Ndebele-speaking people that settled on stone-walled terraced sites at the foot on the mountains. At present it is not clear, but, judged on the pottery found here, these sites might even date to early historic times.

As this was a period of population movement, conflict and change, it in large part set the scene for the current population situation in the country. Considering the time period that they were occupied, they also feature in the early historic period. These sites are therefore viewed to have medium significance and would require mitigation.

11.3 HISTORIC PERIOD (POST AD 1840)

The historic period started c. 1840s, with the arrival of the first white settlers. Negotiations between the trekkers and the Pedi resulted in the Steelpoort River becoming the border between the two groups. Later, tension developed between the two groups, giving rise to armed conflict. One of the better known incidents is the so-called Sekhukhune Wars (1876, 1879). Remains of this event can still be found in the larger geographical region. Another event that took place in the area, was the so-called Mapoch Wars (1863, 1883)

As time went by, the area was divided into farms. At first people were slow to undertake any development, preferring to use the farms for winter grazing as to summers were to hot. In such cases, they established extensive camps and existed by hunting. It was only later that they started with crop farming. This was followed by a period when farmsteads developed, as well as infrastructure (e.g. roads).

11.4 SITE A

Up on the plateau, in the upper dam basin, there are chances of finding sites dating to the historic period. It is possible that some rock shelters may be

found on the steep slopes of the upper rock face. The bottom dams, close to the Steelpoort River could present a problem as research in the proposed De Hoop Dam area has shown that there is a high likelihood of Iron Age sites occurring here. Potential, but as yet unconfirmed, ruins have been found above option A3 on the 1100 m contour, and are unlikely to be disturbed by the proposed reservoir.

11.5 SITE B

No data is available for the lower dams and a field assessment is required. At the upper reservoir however, a small ruin has been found. The layout of the buildings and the siting of the buildings overlooking a gorge down to the plateau below indicate that this ruin could be of significance. The whole region was affected in the late 1800s by the Great Sekhukhune Wars both between the Boers and the British. Many Forts and outposts were built at that time and this could be one such structure (see plates 9, 10 and11). In light of the location of this heritage resource, the dam has been moved slightly to reduce the impact.

Plate 9: Ruin Wall

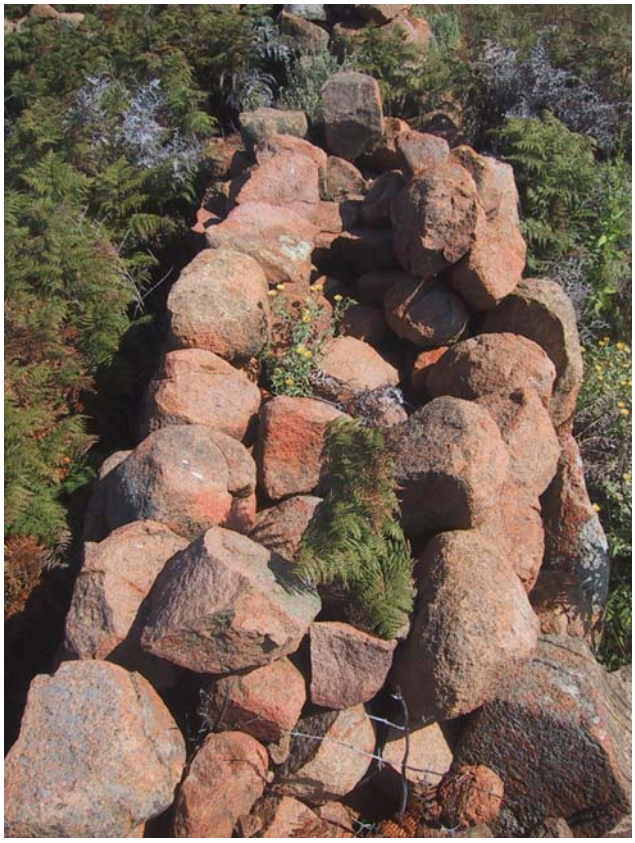


Plate 10: Ruin Wall

Plate 11: Grave

11.6 SITE C

The site consists of only one dam up on the plateau. It is quite likely that sites dating to historic times would be located in the upper basin area. Such sites however may well have been disturbed by farming activities in the area.

11.7 FINAL SUMMARY

Location	Rating
Site A Option 1	2
Site A Option 2	3
Site A Option 3	3
Site B Option 1	2
Site B Option 5	2
Site B Option 7	2
Site C Option 1	4

12 HEALTH AND SAFETY (INCLUDING HIV AND AIDS)

Typical health and safety issues include:

- The influx of a large number of outsiders is likely to result in number of social ills such as prostitution/ stock theft, other security problems and an increase in sexually transmitted diseases, particularly HIV and Aids.
- Due to rapid movement of water and fluctuation in water levels the dam will be a safety hazard for local populace.
- An increase in the number of vehicle using the road during the construction may results in a higher incidence of road injuries and/or deaths, particularly in Sehlakwane.

Sub-Saharan Africa (SSA) remains the region most severely affected by HIV/AIDS in Africa (source: AIDS Epidemic Update: UNAIDS/WHO, December, 2004) The HIV epidemic in SSA is likely to continue to spread for the foreseeable future. About one-third of those currently living with HIV/AIDS are aged 15-24 years.

Demographic data provides some of the clearest sources of knowledge about HIV/AIDS and the workplace. At a symposium on HIV/Aids in the workplace in 2004, it was identified that:

- The HIV prevalence among contract workers is higher than among permanent employees
- There is a higher HIV prevalence in lower paid than higher paid occupations
- The HIV prevalence rate peaks between the ages of 30 and 39 years in men, and among women it peaks at a lower age
- The epidemic disproportionately affects women in Southern Africa.

An analysis of this information points clearly to the fact that development projects could have a significant impact on local and regional prevalence of HIV / Aids. In development projects, the bulk of the workforce is contract, typically coming for areas outside of the region, the wages are generally low, the composition of the workforce is predominantly young male and women in the surrounding community could be at risk.

Socio-cultural and economic as well as demographic changes associated with population mobility in and out of a project area will determine the risk environment related to HIV/AIDS in the communities associated by the project. Within this context, attitudes, values, knowledge and practices affecting safer sex will determine the extent of risk in terms susceptibility and vulnerability. Two risk categories can be identified, that of the risk environment and risk behaviour.

a) Risk Environment

The risk environment is an environment in which the chances of disease transmission are increased as a result of social, economic and cultural factors. Some risk environment factors may include the following:

- Project employees interacting on a regular basis with sex workers (SWs)
- Wage earners with affordable and disposable income for alcohol, drug use and SWs
- Opportunities for SWs to establish activities at project site

- The cultural practices of drunkenness and drug usage associated with sexual activity
- Lack of awareness and knowledge regarding sexually transmitted infections (STIs) and unsafe sex.
- Sexual relationships of people from different areas with unknown sexual histories (casual sex, multiple sex partners, etc.).
- Feelings of loneliness and sexual deprivation due to absence of regular partners.
- Poverty that reduces the ability of SWs to negotiate condom usage with their clients, etc.

b) Risk Behaviour

Individual responses and adaptation to high risk environments arising from a development project may lead to high risk behaviour conducive to HIV/AIDS transmission and infection. Risk behaviour can be classified under unsafe sexual activities, unprotected commercial sex and substance abuse. The following are some examples of risk behaviour:

- Unsafe sexual activity (homo/hetero/bisexual) through commercial and casual sex.
- SWs receptive to unsafe sex for more money.
- High risk behaviour of the individual has a ripple impact on the family, community and society. These include:
    - Exposure of sexual partners to HIV and AIDS infections.
    - Transmission from infected mother to their children during pregnancy, delivery and through breastfeeding.
    - The exposure of others (those outside the project area) to infected sex from workers who leave the project site.
    - Transmission of HIV through SWs within and outside the project area.

12.1 SITE A

Health and Safety is focussed primarily on the potential for people to be negatively influenced by the proximity to the dam. Thus, at Site A the most favourable option is for more remote sites, being Option 3. Construction workforce could change the HIV/Aids profile and thus a comprehensive and holistic management plan is required.

12.2 SITE B

Site B is most favourable since the location is remote. Construction workforce could change the HIV/Aids profile and thus a comprehensive and holistic management plan is required.

12.3 SITE C

Site C is located in close proximity to existing communities and thus presents the least favourable option (see Plate 12). Construction workforce could change the HIV/Aids profile and thus a comprehensive and holistic management plan is required.

Plate 12: Reservoir and proximity to community

12.4 FINAL SUMMARY

Location	Rating
Site A Option 1	2
Site A Option 2	2
Site A Option 3	4
Site B Option 1	4
Site B Option 5	4
Site B Option 7	4
Site C Option 1	2

13 ACCESS ROUTE TO SITE

Access to the various sites will require, in some instances, the construction of a new road and in others, the upgrading of the road.

Required access during construction and operation of the scheme can be classified in four categories namely:

a) Temporary access roads to the site during construction
b) Permanent access roads
c) Permanent access roads to the site
d) Temporary site roads required during construction

13.1 SITE A

Access to site A for all options is relatively easy and no significant impact is expected. At the upper site, a new road will have to be constructed with its associated impact on grazing land.

13.2 SITE B

Site B lower (Option 1 & 5) is relatively easy and no significant impact is expected. Site B lower (Option 7) will require the construction of a new road and this will negatively impact on the environment. The upper reservoir is remote and a new road will need to be constructed over a long distance and this results in a potential increase in impacts along the route (see Plate 13).

Plate 13: Upper dam access route

13.3 SITE C

Access to site C is relatively easy and no significant impact is expected.

13.4 FINAL SUMMARY

Location	Rating
Site A Option 1	4
Site A Option 2	4
Site A Option 3	4
Site B Option 1	2
Site B Option 5	2
Site B Option 7	2
Site C Option 1	4

14 VISUAL IMPACT

The inundation of the reservoirs will clearly alter the aesthetic character of the lower dam and upper reservoir areas considerably at all sites. Temporary visual impacts (landscape scarring) related to the construction phase of the scheme are expected to be significant, due to clearing of construction servitudes, exposure of soils in previously in previously vegetated areas, construction of access roads and haul roads, etc.

The presence of machinery and construction workers at the construction site over the 5-7 year construction period will clearly also represent a relatively significant visual impact for people living in the vicinity.

Although most of the infrastructure is situated underground, dams will be visible to the Sehlakwane community (Upper reservoir) and to farmers living downstream of the lower reservoir. These walls will not be visible from the closest tarred provincial road

Due to periodic fluctuation in water table of the dam due to pumping in between basins, a muddy bank area may often be exposed. This will particularly affect the lower dam..

14.1 SITE A

The visual impact will be minor for the options (1, 2 and 3) but the upper reservoir for options 2 and 3 will be visible from the Steelpoort Valley thus increasing the impact. See Figure 3D 1 in Appendix 1 for a visual projection of the proposed site.

14.2 SITE B

The lower reservoirs will not have a significant impact but the upper reservoir may have an impact and but the impact is uncertain. The Construction of the access road for the lower dam (Option 7) will have a negative visual impact. See Figure 3D 2 in Appendix 1 for a visual projection of the proposed site.

14.3 SITE C

The upper reservoir for Site C will have an impact on visual quality but not significantly change the overall visual effect. See Figure 3D 3 in Appendix 1 for a visual projection of the proposed site.

14.4 FINAL SUMMARY

Location	Rating
Site A Option 1	4
Site A Option 2	4
Site A Option 3	2
Site B Option 1	3
Site B Option 5	3
Site B Option 7	2
Site C Option 1	4

15 INFRASTRUCTURAL DEVELOPMENT

Local and regional infrastructural development at all sites will have a positive impact for the local communities in the area. This positive impact, however, will need to be committed to the project to ensure that the positive impact does not become a negative impact due to no service delivery and thus resistance to the project.

15.1 FINAL SUMMARY

Location	Rating
Site A Option 1	5
Site A Option 2	5
Site A Option 3	5
Site B Option 1	5
Site B Option 5	5
Site B Option 7	5
Site C Option 1	5

16 LOSS OF INCOME

Loss of income can come from 2 main areas:

- Loss of land or access to land for agricultural activities; and
- Defection of farm workers in the area to the construction workforce which may cause problems with local farmers, due to the likelihood that wages will be higher for construction work (albeit for a limited period of employment).

16.1 SITE A

The potential loss of income at all sites except the current scheme is not considered significant. At Option 1, the dam will inundate existing farm land resulting in a loss of income to the farmer. At Option 3, some 25% of the farm portions would be lost for winter grazing purposes, potentially dropping below the break-even point for sustainable economic cattle farming.

16.2 SITE B

The potential loss of income at all sites is not considered significant.

16.3 SITE C

The potential loss of income is significant as the current land use is agricultural crops that provide both food and cash for the farmers. Figure 3 (Appendix 1) shows the relative position of the dam and thus the loss of land for agriculture. A sensitive consultation process is required to address each of the comments from current farmers and to ensure that the net benefit to the community as a whole is maximised. There is an opportunity to re-train the community into fishing but this will need to be explored in more detail.

16.4 FINAL SUMMARY

Location	Rating
Site A Option 1	2
Site A Option 2	4
Site A Option 3	4
Site B Option 1	4
Site B Option 5	4
Site B Option 7	4
Site C Option 1	2

17 EMPLOYMENT CREATION

A positive impact of the proposed dam will be the employment of an average of 2000 construction workers over a 5-7 year period, (300 for upper reservoir and 1700 for the powerhouse and lower reservoir), with 1000 sourced from local communities. Peak employment during construction is set to reach 400 and 3100 for the upper and lower reservoir. At all sites there will be a potential for employment, which is a positive impact, except at Site B where

the potential benefits are uncertain due to the remoteness of the upper reservoir.

17.1 FINAL SUMMARY

Location	Rating
Site A Option 1	5
Site A Option 2	5
Site A Option 3	5
Site B Option 1	3
Site B Option 5	3
Site B Option 7	3
Site C Option 1	5

18 ENVIRO-LEGAL

The enviro-legal impact of the pumped storage schemes will need to be considered in light of the following legislation:

- National Water Act (Act No 36 of 1998);
- National Environmental Management Act (Act No 107 of 1998);
- Conservation of Agricultural Resources Act (Act 43 of 1983);
- National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004);
- Mineral and Petroleum Resources Development Act (Act 28 of 2002);
- National Heritage Resources Development Act (Act 25 of 1999);
- Environment Conservation Act (Act 73 of 1989); and
- National Environmental Management: Biodiversity Act (Act 10 of 2004).

The Regulations in terms of the Environmental Conservation Act (Act 73 of 1989) have been replaced by the new Regulations identified in Terms of Sections 24 and 24D of the National Environmental Management Act, 1998.
To maximise the probability for approval by the Limpopo Provincial Government to the proposed pumped storage scheme, the benefit for local communities at the upper reservoir must be significant. As the level of direct benefits to these communities decreases, so the risk of a negative Environmental Authorisation increases.

Although the point has been stressed during the public information meetings that Eskom will not be providing water to the communities the presence of large dam adjacent to a highly water stressed - community is likely to result in confrontation at some point unless alternative supplies are provided at some point (by Department of Water Affairs and Forestry, or by Eskom)

18.1 SITE A

The current Record of Decision for Option 1 was granted by the Mpumalanga Department of Agriculture and Land Administration and while approval has been granted, there is an issue concerning two dams on the Steelpoort River in close proximity to each other. The responsible authority has changed from Mpumalanga to Limpopo but this will not affect the current positive ROD.

For Option 3 a new EIA will be required and thus the process is to be repeated.

The Department of Minerals & Energy has also indicated that should material from the basin or the tunnels be used in any part of the construction programme, then a Mining Permit will be required.

A land claim is currently in place for the whole of Site A lower. The registered land owners and legal representatives of each party have conducted site inspections, *inter alia* grave identification, on the various sub-divisions on 20 May 2006, as part of the claim validation process.

In terms of the National Environmental Management: Biodiversity Act, permits are required from the Limpopo Department of Nature Conservation to remove rare or endangered plant species and from DWAF from rare or endangered trees.

18.2 SITE B

There is uncertainty with regard to the approval by the Limpopo Provincial Government for the upper dam at this site. This is based on the proximity to

a potential cultural ruin of significance. There is also uncertainty with regard to the lower dam Option 3 being within a private nature reserve and the legal status of this area not having been ascertained as yet.

A land claim is currently in place for the whole of Site B lower. The registered land owners and legal representatives of each party have conducted site inspections, *inter alia* grave identification, on the various sub-divisions on 20 May 2006, as part of the claim validation process.

In terms of the National Environmental Management: Biodiversity Act, permits are required from the Limpopo Department of Nature Conservation to remove rare or endangered plant species and from DWAF from rare or endangered trees.

18.3 SITE C

There is uncertainty as to the opinion of the Limpopo Provincial Government regarding the loss of agricultural land. In other provinces development on medium to high agricultural land is not supported.

18.4 FINAL SUMMARY

Location	Rating
Site A Option 1	2
Site A Option 2	2
Site A Option 3	3
Site B Option 1	3
Site B Option 5	3
Site B Option 7	3
Site C Option 1	2

19 ENVIRONMENTAL SCREENING SUMMARY

Based on the findings presented above the sites have been ranked according to their points awarded for each section and their favourability status. The results are presented in the following Table.

Location	Total Score	Ranking
Site A Option 1	44	6
Site A Option 2	47	3
Site A Option 3	52	1
Site B Option 1	45	5
Site B Option 5	46	4
Site B Option 7	44	6
Site C Option 1	52	1

The environmental assessment indicates that two options are suitable, Site C Option 1 and Site A Option 3. Should a larger storage volume be considered, then the overall preferred option would be Site C Option 2, as the new upper dam replaces an existing small farm dam (i.e. the impact has already occurred, although the extent would be greater).

20 PUBLIC PARTICIPATION

20.1 INTRODUCTION

The public participation that was undertaken is not a legal process in terms of the EIA Regulations published in terms of the Environment Conservation Act (Act 73 of 1989). However, as part of its duty of care towards the environment as regulated by section 28 of the National Environmental Management Act (Act 107 of 1999), Eskom has decided to inform the public of its intentions with regards to the approved Steelpoort Pumped Storage Scheme and to investigate a potential new pumped storage scheme in the Steelpoort area (i.e. Project Lima) and the subsequent environmental screening investigation.

The purpose of the public participation chapter is to provide:

- a description of the public participation process followed;
- a list of issues, comments and concerns raised during the consultation process;
- key conclusions and recommendations based on inputs received;
- copies of project related information (minutes of the meetings held, advertisements, on-site notices, Background Information Documents (BIDs), etc.); and
- a list of the registered interested and affected parties (I&APs).

20.2 OBJECTIVES OF THE PUBLIC PARTICIPATION PROCESS

The public participation process followed had the following objectives:

- identification of I&APs from the previous EIAs (i.e. L&W EIA for Steelpoort Pumped Storage Scheme and BKS EIA for the Olifants River Water Resources Project or De Hoop Dam);
- informing identified I&APs about the status of the previous studies and the need for the current study by ensuring information dissemination to I&APs with regard to the proposed project and associated activities;
- identification of issues, comments and concerns as raised by I&APs;
- promoting transparency and an understanding of the project and its consequences;

- serving as structure for early liaison and communication with I&APs; and
- transferring information with regards to potential initial environmental (biophysical and social) impacts and benefits.

The aim of a public participation process is to highlight feasible solutions, and consider the acceptability of these solutions to I&APs through public consultation and involvement. It is thus important that I&APs are involved in the process to ensure informed decision-making and resolve issues which may otherwise result in opposition against the project.

20.3 PUBLIC PARTICIPATION APPROACH

The following section provides an outline of the public participation process undertaken during April and May 2006.

20.3.1 Site Inspection

A site inspection was undertaken that enabled the observation of the area and the identification of key I&APs. Further project-related information was gathered as part of this process.

In addition, relevant project-related information was studied to obtain relevant information and to be able to pro-actively identify issues and concerns that could be raised by I&APs.

20.3.2 Identification of Interested and Affected Parties and Stakeholders

Key I&APs were identified at the start of the project by means of the site visit and networking. Identification of I&APs also took place through existing contacts and databases (i.e. L&W Environmental and DWAF), and a proactive process to identify key I&APs within the study area.

The identification of I&APs continued throughout the process and I&APs were requested to study the Background Information Document (BID) and to inform BKS-Palace of additional role-players that should be contacted.

Persons/organisations identified as possible interested and/or affected parties and those contacting the public participation office were registered on the database thereby ensuring their inclusion in a dynamic database and their involvement in the consultation process.

Refer to Appendix 2.1 for copies of the databases for the upper and lower reservoirs.

20.3.3 Public Notices

Public Notices were placed in public places, such as municipal offices, Tribal Council offices, and local shops, in the Greater Groblersdal Local Municipality and the Makhuduthamaga Local Municipality on 26 and 27 April 2006. The objectives of the public notices were to:

- Inform I&APs of the proposed project;
- Inform I&APs of the Public Meetings (date, venue and aim); and
- Invite I&APs to become involved in the proposed project by registering as I&APs.

Refer to Appendix 2.2 for a copy of the public notice.

In the Greater Groblersdal Local Municipality, public notices were also broadcasted on Kwekwezi FM and on Thobela FM during the news breaks on 4 May 2006 (see Appendix 2.3 for requests to broadcast the public meetings on radio).

20.3.4 Background Information Document (BID)

A Background Information Document (BID) was compiled and distributed to all I&APs on the database. Copies of the BID were also faxed and e-mailed to the I&APs potentially affected by the lower reservoirs. The BID included information regarding the locality and extent of the proposed project, a description of the project, as well as the public participation process.

It should be noted that the BID was not a technical document, but provided I&APs with detailed and understandable information about the proposed project.

Refer to Appendix 2.4 for a copy of the Background Information Document and comment form.

The comment form provided I&APs an opportunity to raise any issues, comments and concerns regarding the proposed project and to register as I&APs.

20.3.5 Consultation with I&APs

Consultation with identified I&APs (see Appendix 2.1) took place via telephone (both landline and cellular), facsimile, electronic mail and short message service (SMS) to:

- Obtain and verify these I&APs' contact details and representation of organisations;
- Inform them of the proposed project;
- Inform them of and invite them to the public meeting; and
- Gather initial comments regarding the proposed project.

Documentation sent via electronic mail and facsimile included the Background Information Document, the invitation to the public meetings and the interested and affected parties comment and query form.

20.3.6 Public Meetings

Two public meetings were held on 5 May 2006, namely at 9:00 in the Phatantswana Library in Phatantswana (closest to Site C) in the Makhuduthamaga Local Municipality (see Plate 13) and at 14:00 in the Hlogotlou stadium (closest to Sites A and B) in Monsterlus in the Greater Groblersdal Local Municipality (see Plate 14).

Both the local community and the local farmers were notified and invited by fax, telephone, SMS and e-mail to the attend one of the two public meetings.

Plate 13: Phatantswana public meeting

Plate 14: Hlogotlou public meeting

The key objectives of the public meeting were to provide:

- I&APs with more information regarding the project and the process to be followed;
- feedback on some of the specialist studies undertaken (Heritage Survey and Ecological Survey); and
- the opportunity for I&APs to raise concerns and ask specific project-related questions.

Presentations on the background, identification of alternative sites, and findings of this environmental screening investigation report were made to

both communities. The I&APs were then given the opportunity to raise issues and/or concerns (see Section 20.3.7 overleaf).

Minutes of the public meetings were compiled and distributed to the I&APs that attended the meeting. Refer to Appendix 2.5 for a copy of the agenda and minutes of the public meetings.

Appendix 2.6 lists the attendance registers for both public meetings.

20.3.7 Issues and/or Concerns Raised by I&APs

The following issues and/or concerns were raised by I&APs during the public participation process. The response from Eskom to each issue/concern raised is also listed.

ISSUES / CONCERNS	RAISED BY	ESKOM RESPONSE
Cultivated land needs to be taken care of in the event of loss of arable land.	Phatantswana Community Members	Land values are determined by the government. Compensation based on these land values may be paid for the loss of cultivated land.
What area will the project entail?	Phatantswana and Hlogotlou Community Members	Engineers will still undertake detailed investigations, but the dams will be approximately be 30-50 ha or 40-60 morgans in size.
What is the capacity of the dam?	Hlogotlou Community Members	The storage capacity of the dam will be approximately 6000 megalitres.
During which periods is employment offered?	Phatantswana Community Members	Various periods will be available for employing members of the community, but the overall duration of construction is approximately 5 years. This is determined by the type of work that needs to be undertaken.
What access roads will be used?	Phatantswana and Hlogotlou Community Members	Existing roads will be upgraded and new access roads will be built, where required.

ISSUES / CONCERNS	RAISED BY	ESKOM RESPONSE
What will be the benefits of the project to the local community?	Phatantswana Community Members	The project will benefit South Africa nationally as it creates electricity for the national grid. The local community will benefit as following: • Employment during the construction phase • Fewer jobs will be available after construction • Community members will undergo skills training which could be used elsewhere • Water pumped up the mountain could also be used for domestic purposes. Eskom and DWAF are currently negotiating this
When will the project be decided?	Phatantswana and Hlogotlou Community Members	During June 2006 the community will be informed which site will be investigated further. The final decision is expected near the end of 2007 once studies have been completed for the final site. In 2009 construction is scheduled to start, pending the successful completion of the EIA Phase. Construction will continue for about 5 years until about the end of 2014.

ISSUES / CONCERNS	RAISED BY	ESKOM RESPONSE
If graves are identified, which process will be followed?	Phatantswana Community Members	A specialist heritage assessment would be undertaken to identify graves and any sites of archaeological and cultural importance during the EIA Phase. If graves have been found, the identity of the buried person and their relatives will be determined. Discussions with the relatives will be held as to where and how to relocate the graves and what traditional customs must be followed. The client (Eskom) will pay for the relocation of graves.
What type of dam will be built?	Phatantswana Community Members	The type of dam will be looked at in more detail once the final site is selected. The wall type will probably be rock with concrete on the inside and a soil and grass cover on the outside. As the water is fast moving and is dangerous, the site will be fenced for the community's safety.
How flexible is the location of the dam?	Phatantswana Community Members	The location of the dams is flexible but this depends on costs associated with the location i.e. grave and house relocations etc. The site with the least disturbances will be selected.

ISSUES / CONCERNS	RAISED BY	ESKOM RESPONSE
Could the project aid in sports promotion in the community?	Phatantswana Community Members	During the EIA phase, a social impact assessment will be undertaken to identify the needs of the community.
What level of skills training will be given during construction of the project?	Phatantswana and Hlogotlou Community Members	Community members employed on the project will undergo life and skills training which could be used on other projects undertaken in the area.
What qualifications are required for jobs on this project?	Hlogotlou Community Members	Various qualifications for the jobs will be required. This will be dependant on the job and the skill level required. Some employed persons will be external people but the majority will be from the local community. Training and skills transfer will happen so once the project is completed, people may use their new skills elsewhere
Site B preferred as it will create employment opportunities which will be benefit the community.	Hlogotlou Community Members	Comment noted.

ISSUES / CONCERNS	RAISED BY	ESKOM RESPONSE
Will any people be displaced on any of the dam sites?	Hlogotlou Community Members	Eskom does not want to disturb people and thus wishes to select a site where this will be possible. No displacements of people will be needed on the upper three dam sites. Some displacements will be needed on the lower dam sites.
What social responsibilities will reach the community?	Hlogotlou Community Members	Community members will undergo life and skills training, sports and recreation will also be considered
What will the impact be on existing water resources?	Hlogotlou Community Members, Niek Gouws (owner of Steynsdrift 145 JS), Johan Roux (farmer on Steynsdrift 145 JS and portion 5 of Luipershoek 149 JS), Louis Kritzinger (owner of portions 1 and 7 of Luipershoek 149 JS)	No significant impact on the water resources is expected as the dams are not located on any major rivers. The ecological reserve of the Steelpoort River will be maintained. This needs to be investigated during the EIA process.
Will blasting occur and how will it affect the communities?	Hlogotlou Community Members	Blasting will be done away from the community and mainly underground and the community should not be affected.
What type of air pollution will be created?	Hlogotlou Community Members	This is a clean project in terms of air pollution as no coal will be burned. There may be a little dust during the

ISSUES / CONCERNS	RAISED BY	ESKOM RESPONSE
		construction phase but this may be mitigated by various dust suppression techniques.
Do any mineral deposits occur in the identified sites?	Hlogotlou Community Members	Geological investigations have shown that there are no mineral deposits of significant value in the area.
What output of power will be generated by the project?	Hlogotlou Community Members	The project will be used to supply power during morning and evening peak demand periods.
Why type of power station will be used?	Hlogotlou Community Members	For environmental reasons, as this type of power generation is clean, with little pollution.
Can the white farmers manipulate the level of compensation paid to community members?	Hlogotlou Community Members	The farmers cannot manipulate the land values as this is determined by the government.
Mr du Toit was very upset about the venue choices as the farmers apparently do not feel safe in the venues chosen. In the past, they have experienced victimization by the local black community members. The venues appear to have been chosen only to benefit the black communities. Another meeting should be held for the farmers in a safe venue.	Mr Francois du Toit (Farms Tiegerhoek portion 3 and Buffelskloof remaining portion)	Comment noted which will be considered during the EIA process. Mr du Toit was requested to complete the comment form attached to the BID and submit it for inclusion into the public participation report. However, this was never received.

ISSUES / CONCERNS	RAISED BY	ESKOM RESPONSE
During investigations, Eskom appointed personnel must ensure the following: • Fires are not permitted as it could burn down the entire mountain; • Gates must be kept closed at all times; • Every effort must be made to ensure no change in the crime status; and • Interaction with the local community must be restricted.	Niek Gouws (owner of Steynsdrift 145 JS), Johan Roux (farmer on Steynsdrift 145 JS and portion 5 of Luipershoek 149 JS), Louis Kritzinger (owner of portions 1 and 7 of Luipershoek 149 JS)	Comments are noted and will be included in the EIA process.
Will the reservoir be filled from the Steelpoort River, will this in turn affect the flow in the Steelpoort River and irrigation rights of the affected farmers downstream of the abstraction point?	Niek Gouws (owner of Steynsdrift 145 JS), Johan Roux (farmer on Steynsdrift 145 JS and portion 5 of Luipershoek 149 JS), Louis Kritzinger (owner of portions 1 and 7 of Luipershoek 149 JS)	The reservoir will be filled from the Steelpoort River during high flows only. The Ecological Reserve of the tributary as well as the Steelpoort River will be maintained for the lifetime of the project. This needs to be investigated during the EIA process.

Apart from the comments received during the public meeting, several comments supporting Site C were received on the comment forms (see Appendix 2.7). No other completed forms were received from I&APs potentially affected by Sites A and B.

20.4 CONCLUSION

From the inputs received during the public participation process, the following conclusions can be drawn:

- Upper Reservoirs:
    - Limited concerns were raised with regard to the bio-physical environment. Some social concerns related to safety and security issues, the impact of the proposed upgrading on the quality of life of the residents, and the economic spin-offs that may arise out of the project.
    - At this stage there is no evidence of attitude formation against the proposed project, although there are differences in opinion amongst the communities regarding the proposed location of the upper reservoir.
- Lower Reservoirs:
    - A number of farmers and potentially affected property owners were contacted, and except for one objection, no completed comment forms were received.
    - One telephonic objection was received with regards to the location of the public meetings, as these favoured the local communities, who apparently intimidate the property owners, fearing for their lives.
    - Farmers on Site A indicated that they had no immediate objections.
    - Due to time constraints, a meeting could not be arranged with the I&APs.

From a communication and information perspective, the following general recommendations are made:

- Should any negotiations with individual property owners be necessary, it should be undertaken in a considerate and constructive manner. Sensitive issues such as the possible economic impact on

the properties, as well as safety and security should be taken into account.

- Communication with the communities and affected property owners should continue to ensure informed decision-making and a transparent process throughout.

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APPENDIX 1: MAPS AND FIGURES

APPENDIX 2: PUBLIC PARTICIPATION

APPENDIX 2.1: DATABASES OF INTERESTED AND AFFECTED PARTIES

APPENDIX 2.2: PUBLIC NOTICE

APPENDIX 2.3: REQUEST TO BROADCAST PUBLIC MEETINGS ON RADIO

APPENDIX 2.4: BACKGROUND INFORMATION DOCUMENT

APPENDIX 2.5: AGENDAS AND MINUTES OF PUBLIC MEETINGS

APPENDIX 2.6: ATTENDANCE REGISTERS FOR PUBLIC MEETINGS

APPENDIX 2.7: COMPLETED COMMENT FORMS