5. METHODOLOGY TO BE USED DURING IMPACT EVALUATION DURING THE ESS

This chapter outlines the approach followed to evaluate the identified potential environmental impacts associated with the proposed project alternatives prior to the implementation of any mitigation measures (i.e. measures to reduce or avoid impacts).

In order to determine the preferred site and option alternatives to evaluate in the EIA phase, a site specific evaluation was undertaken. The process involved a range of bio-physical and socio-economic criteria.

5.1. Site Evaluation – Environmental Screening Investigation Desk-top and Field Studies

The findings regarding the alternative sites and options addressed in the screening study were reviewed by the specialists at a desk-top level and, to a relatively limited extent, through field studies, in order to:

- Investigate the study area
- Gather baseline information for the sites
- Assess the current situation
- Identify any potential environmental (biophysical and social) impacts
- Engage interdisciplinary discussions
- Verify the findings of the screening report

5.2. Specialist Inputs

The choice of specialist studies was influenced by the need to cover all relevant aspects of the environment required in order to inform the decision regarding the most appropriate site for the proposed PSS. These included bio-physical and socio-economic studies. An enviro-legal investigation was also conducted to ensure that all legal requirements are met.

The studies undertaken in the screening study covered bio-physical and socio-economic aspects of the environment. Table 4.1 outlines the components or issues that were used in ranking the sites.

Table 5.1: Specialist studies and the components investigated during the Environmental Screening Investigation (ESI)

BIO-PHYSICAL ASPECTS	
Geology	Geotechnical
	Geology
Soils	Land types
Agricultural Potential	Terrain form
	Land Type
	Agricultural potential
Terrestrial Ecology: Flora	Vegetation description (current environment)
	Species and communities of concern
	Red Data taxa
	Sekhukhuneland Centre of Endemism
Terrestrial Ecology: Fauna	Nature reserves in the area
	Species occurring in the study area
	Species of concern
	Red Data taxa
Water Resources and Riverine Ecology	Description of drainage lines to be affected
	Hydrology
	Water quality
	Eutrophication and emission of greenhouse gases
	Potential increase in *Bilharzia*
	Riverine habitat
	Fauna occurring in riverine habitats
	Potential disruption of fish migration
Climate	Temperature
	Rainfall
SOCIO-ECONOMIC ASPECTS	
Displacement of persons	Potential displacement
Health and safety	HIV / Aids - Risk environment - Risk behaviour Safety issues pertaining to rapid rising and falling of dam levels
	Potential increase in road fatalities
Access route	Access route
Infrastructural development	Local and regional infrastructural development
Loss of local income due to project	Loss of land or access to land for agricultural activities

	Defection of farm workers to construction workforce
Generation of employment by project	Temporary: construction phase
	Long-term: operational phase
Heritage	Presence or absence of sites of heritage-related significance
	Stone age sites
	Iron age sites
	Historic period
Visual impacts	Temporary: construction phase Long-term: operational phase
ENVIRO-LEGAL INVESTIGATIONS	
National Water Act (Act No 36 of 1998)	
National Environmental Management Act (Act No 107 of 1998)	
Conservation of Agricultural Resources Act (Act No 43 of 1983)	
National Environmental Management: Biodiversity Act, 2004 (Act No 10 of 2004)	
Mineral and Petroleum Resources Development Act (Act No 28 of 2002)	
National Heritage Resources Development Act (Act 25 of 1999)	
Environment Conservation Act (Act 73 of 1989)	

Table 5.2: Specialist studies and the components investigated by the specialist team during the ESS

BIO-PHYSICAL ASPECTS	
Soils and Agricultural Potential	Soils and Agricultural Potential
Flora	Vegetation description (current environment)
	Red Data taxa
Fauna	Species occurring in the study area
	Red Data taxa
Water Resources	Wetlands
	Groundwater resources (Hydro-geology)
Climate	Temperature
	Rainfall
SOCIO-ECONOMIC ASPECTS	
Air Quality	Baseline air quality study
Social Impact Assessment (SIA)	Displacement of persons
	Health and safety
	Employment
Heritage	Presence or absence of sites of heritage-related significance
	Significance, conservation value and location of sites of heritage-related significance

	Mitigation and management measures
Visual impacts	Temporary: construction phase Long-term: operational phase
Tourism	Current tourism activities in the area
	Potential impacts on tourism activities in the area
Traffic	Construction and/or upgrading of access routes to site
	Impact of construction-phase vehicles on local traffic and roads

5.3. Rating Methodology and Criteria

In the **ESI,** the rating for each of the aspects considered was totalled and the site with the highest number of points considered the preferred site. The investigated sites and options were then ranked according to their score.

In the **ESS**, a preferred site was nominated for each of the aspects considered (e.g. fauna, flora, heritage, social, traffic, etc), taking into consideration the anticipated duration and scale of impacts that might be expected in terms of these parameters. These aspects were then weighted – for instance, in this case permanent ecological and hydrological aspects were assigned a greater weight / priority than temporary traffic impacts. Through this process, an overall preferred site was selected, one at which it is expected that negative environmental (biophysical and socio-economic) impacts will be the least.

As the *detailed* assessment of each identified impact/issue will only take place during the EIA phase of the project, it is not possible to consider the significance of identified potential impacts during the ESI or the ESS phase of the project. The purpose of ESI / ESS was therefore to identify impacts/issues and determine which of these impacts are potentially significant. Potentially significant impacts are flagged for detailed assessment during the detailed EIA phase of the project. Impacts that can be categorically determined to be insignificant at a desk-top level need not be considered further during the EIA phase of the project.

The *duration*, *probability*, *intensity* and *significance* of each identified potentially significant impact will be evaluated in detail for the preferred alternative during the detailed EIA phase of the project. In addition, detailed mitigation and management measures will be developed during this phase of the project and detailed in an Environmental Management Plan (EMP). As a result, such aspects are not considered within the scope of this ESS.

The evaluation and nomination of a potential site for a proposed Pumped Storage Scheme involved a highly interdisciplinary approach. The approach undertaken has involved a wide range of specialist studies which examine a number of

different issues – the bio-physical and socio-economic aspects that were examined are outlined in Table 5.1 above. Technical and engineering aspects were also considered.

In order to evaluate sites and determine the most appropriate site (i.e. the site with the least negative and/or most positive potential impacts in terms of the aspects that were investigated), the studies need to be comparative and therefore a site rating system was developed for the screening investigation:

- **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 as to the nature and extent of the impact, primarily due to a lack of information on site-specific conditions
- **Less favourable** (rated at 2 points) = Sufficient information exists to determine that the site will be negatively impacted upon
- **Fatal flaw** (rated at 1 point) = Where there could be an impact which cannot be mitigated

A summary of the anticipated extent, duration, probability, significance and status of each potential impact can be found at the end of each sub-section within Chapter 6. The summary of the impacts relates to the construction and/or operational phases of the proposed project where applicable. The following criteria have been used for the classification of impacts:

- the *extent*, wherein it will be indicated whether the impact will be local (limited to the site of development), limited to the immediate surroundings, sub-regional, regional, or national,
- the *duration*, wherein it will be indicated whether the lifetime of the impact will be of a short-term (0 – 5 years), medium-term (5 – 15 years), long-term (> 15 years) or permanent,
- the *probability*, which shall describe the likelihood of the impact actually occurring, indicated as improbable (low likelihood), probable (distinct possibility), highly probable (most likely), or definite (impact will occur regardless of any preventative measures),
- the *significance*, which shall be determined through a synthesis of the characteristics described above and can be assessed as low, medium or high, and
- the *status*, which will be described as either positive, negative or neutral.

A synthesis of the description of the above characteristics of each identified issue

assisted in the determination of the potential significance of the issues. The issues rated to be of medium or high significance were highlighted as issues requiring further investigation and assessment within the EIA phase.