

5. SITE SELECTION PROCESS UNDERTAKEN DURING THE ENVIRONMENTAL SCOPING STUDY

The Environmental Scoping Study identified the potential positive and negative environmental (biophysical and social) impacts associated with the proposed establishment of a Concentrating Solar Power (CSP) Plant and additional infrastructure. A number of issues for consideration were identified by the environmental team and/or raised by I&APs during the consultation process. This section serves to outline the approach utilised to evaluate the alternative sites and select a preferred site for the establishment of the proposed CSP Plant and associated infrastructure.

A number of issues were identified and potential environmental impacts of the CSP Plant and additional infrastructure alternatives were considered in the selection of a preferred site for the construction of the CSP Plant, as well as in determining what further studies would be required in the Environmental Impact Assessment (EIA) phase. All issues which were anticipated to have a moderate to high impact on the preferred sites have been investigated further by specialists and detailed within the EIA phase of the study.

The scoping process evaluated three alternative sites for the CSP Plant. The footprint of the proposed CSP Plant is anticipated be approximately 400 ha (i.e. 4 km²). In order to establish the best possible site to evaluate in the EIA, a site specific evaluation was undertaken. The process involved a range of physical, biological and social criteria.

5.1. Site Evaluation – Field Studies

The three alternative sites were inspected by the specialists 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 in interdisciplinary discussions
- Interview Landowners

5.2. Specialist Studies

The choice of specialist studies undertaken during the Environmental Scoping Study was influenced by the need to cover all aspects of the environment namely, physical, biological and social.

The studies undertaken covered the physical, biological and social aspects of the environment. Table 5.1 outlines the components or issues that were used in ranking the sites. Over 72 components were reviewed by the specialists through 11 studies.

Table 5.1: Specialist studies and the components investigated during the Environmental Scoping Phase

Physical Variables		
Groundwater Resources	Depth to groundwater	
	Aquifer type	
	Groundwater yield class (DWAF category).	
	Groundwater quality	
	Aquifer strategic importance	
Surface Water Resources	Infiltration rates	
	Susceptibility of soil-surface sealing	
	Susceptibility of soil to compaction	
	Erodibility	
	Vulnerability off-site to flooding generated by development	
Soils and Agricultural Potential	Soil types	
Biological Variables		
Avifauna	Presence of Red Data Bird species	
	Habitat uniqueness	
	Existing disturbance levels	
	Proximity to existing power line infrastructure	
	Proximity to existing roads	
Fauna and Flora	Vegetation Characteristics	Habitat diversity: species composition / richness
		Presence of rare and endangered species
		Ecological function
		Uniqueness / conservation

		value
	Vegetation Condition	Percentage ground cover
		Vegetation structure
		Infestation with exotic weeds and invader plants or encroachers
		Degree of grazing / browsing impact
		Signs of erosion
	Terrestrial Animal Characteristics	Presence of rare and endangered species
Social Variables		
Visual	Visual exposure of central receiver	
	Visual exposure of heliostats	
	Visual exposure to major towns or built up areas	
	the length of time or duration the proposed CSP plant would be visible to road users	
	length of visual exposure of the facility from major roads	
	quality of the immediately affected visual environment	
	Presence/absence of existing visual clutter	
	Level of disturbance of natural vegetation	
	Proximity to existing transmission line infrastructure	
Tourism	Visual	
	Presence of established Tourism Plant	
	Traffic	
	Potential for future Tourism Development	
Heritage	Presence / absence of heritage objects / sites	
Noise	The extent to which the existing noise climate is degraded, thereby reducing the impact of the new Plant.	
	Potential for impact from CSP Plant construction activities.	

	Potential for impact from CSP Plant construction traffic	
	Potential for impact from pump station construction activities	
	Potential for impact from pump station construction traffic	
	Potential for impact of CSP Plant operations on urban areas	
	Potential for impact of CSP Plant operations on settlement areas.	
	Potential for impact of CSP Plant operations on farmhouses and farm labourer houses	
	Potential for impact of CSP Plant operational traffic	
	Potential for impact from pump station operations	
	Ease to apply mitigating measures	
Social Impact Assessment	Population Characteristics	Population Change
		Ethnic and racial distribution
		Relocated populations
		Influx or outflows of temporary workers
		Seasonal residents
	Community and Institutional Structures	Interest group activity
		Size and structure of local government
		Historical experience with change
		Employment/income characteristics
		Employment equity of minority groups
		Enhanced economic inequities
		Local/regional/national linkages
		Industrial/commercial diversity
	Presence of planning and zoning activity	
Conflicts between local residents and newcomers	Presence of an outside agency	
	Introduction of new social classes	

	Political and Social Resources	Distribution of power and authority
		Identifications of stakeholders
		Interested and affected publics
		Leadership capability and characteristics
Technical Variables		
Technical Criteria	Existing roads and their condition	
	Existing transmission lines and electrical infrastructure	
	Future planned transmission lines	
	Technical support infrastructure close by	
	Airport	
	Boarding and lodging close by	
	Water supply from municipality	

5.3. Rating Criteria

The evaluation and nomination of a potential site for the CSP Plant involved a highly interdisciplinary approach. The approach undertaken involved a wide range of specialist studies which examined a number of different issues. In order to evaluate sites and nominate a preferred site, the studies needed to be comparative and therefore a site rating matrix was developed. The site preference rating system was applied to each discipline, and the rating of each site was conducted according to the following system:

- 1 = Not suitable for development (impact of very high significance - negative)
- 2 = not preferred (impact of high significance - negative)
- 3 = acceptable (impact of moderate significance - negative)
- 4 = preferred (impact of low or negligible significance - negative)
- 5 = Ideal site for development, or positive impact

While each specialist study was required to have the Site Preference as an outcome, how they evaluated each site varied from discipline to discipline.

Table 5.2 includes the site preference ratings that were included in the Environmental Scoping Study.

Table 5.2: Site preference ratings included within the Environmental Scoping Study

Site	Site Preference Rating (SPR)
Surface Water	
Site 1 (Olyvenhouts Drift)	4 (preferred)
Site 2 (Bok Poort 390)	4 (preferred)
Site 3 (Tampansrus)	4 (preferred)
Ground water	
Site 1 (Olyvenhouts Drift)	3 (acceptable)
Site 2 (Bok Poort 390)	3 (acceptable)
Site 3 (Tampansrus)	2 (not preferred)
Soils	
Site 1 (Olyvenhouts Drift)	3 (acceptable)
Site 2 (Bok Poort 390)	4 (preferred)
Site 3 (Tampansrus)	3 (acceptable)
Ecology	
Site 1 (Olyvenhouts Drift)	4 (preferred)
Site 2 (Bok Poort 390)	3 (acceptable)
Site 3 (Tampansrus)	3 (acceptable)
Avifauna	
Site 1 (Olyvenhouts Drift)	4 (preferred)
Site 2 (Bok Poort 390)	5 (ideal)
Site 3 (Tampansrus)	1 (sensitive)
Heritage	
Site 1 (Olyvenhouts Drift)	4 (Preferred)
Site 2 (Bok Poort 390)	4 (Preferred)
Site 3 (Tampansrus)	4 (Preferred)
Tourism	
Site 1 (Olyvenhouts Drift)	2 (not preferred)
Site 2 (Bok Poort 390)	3 (acceptable)
Site 3 (Tampansrus)	4 (preferred)
Visual	
Site 1 (Olyvenhouts Drift)	2 (not preferred)
Site 2 (Bok Poort 390)	4 (preferred)
Site 3 (Tampansrus)	4 (preferred)
Noise	
Site 1 (Olyvenhouts Drift)	4 (preferred)
Site 2 (Bok Poort 390)	3 (acceptable)
Site 3 (Tampansrus)	2 (not preferred)
Social	
Site 1 (Olyvenhouts Drift)	2 (not preferred)
Site 2 (Bok Poort 390)	4 (preferred)
Site 3 (Tampansrus)	3 (acceptable)
Land Use	
Site 1 (Olyvenhouts Drift)	3 (acceptable)
Site 2 (Bok Poort 390)	4 (preferred)
Site 3 (Tampansrus)	3 (acceptable)

The site preference results for each site from each specialist study were then entered into a matrix and added together. The site with the highest value is then considered the most preferable.

The standard matrix as described above, gives equal importance to each variable. Therefore, a weighted matrix was also used. In a weighted matrix each variable is given a different importance weighting. Input from the project team and all specialists was utilised for the allocation of weightings to the different variables. Each member of the Project team was asked to rank each variable according to their significance:

- 1 – low significance
- 2 – medium significance
- 3 – high significance

Once the average weighting for each variable was obtained it was multiplied by the Site Preference Rating to give a weighted SPR for each variable.

In order to nominate the preferred site for further study in the environmental impact assessment phase, the identified alternative sites were weighted against one another using a ranking matrix. The objective of the matrix is to calculate a comparative score.

• **Environmental and Social Criteria**

Table 5.3 outlines the un-weighted and weighted ranking scores for the environmental and social criteria. The scores utilised are based on the results of the various specialist studies undertaken during the Environmental Scoping Study.

Table 5.3: Environmental and Social Matrix

Criteria	Weighting	Unweighted			Weighted		
		Site 1	Site 2	Site 3	Site 1	Site 2	Site 3
Biophysical Criteria							
Soil	1.6	3	4	3	4.7	6.3	4.7
Fauna and Flora	2.3	4	3	3	9.0	6.8	6.8
Avifauna	2.2	4	5	1	8.8	10.9	2.2
Surface Water	1.6	4	4	4	6.3	6.3	6.3
Ground Water	1.7	3	3	2	5.1	5.1	3.4
Social Criteria							
Heritage	1.7	4	4	4	6.8	6.8	6.8
Social Impact	2.6	4	2	3	10.5	5.3	7.9
Land use	1.5	3	4	3	4.5	6.0	4.5
Noise	1.7	4	3	2	6.8	5.1	3.4
Tourism	1.8	2	3	4	3.5	5.3	7.0
Visual	2.4	2	4	4	4.9	9.8	9.8
Total Score		37	39	33	70.6	73.3	62.5

It should be noted that during the Environmental Scoping Study the specialist studies found no fatal flaws at any of the three alternative sites that would eliminate one site. The environmental and social matrix showed that there was only a small difference in score between the three sites from an environmental and social perspective. According to the matrix Site 2 is considered to be the preferred site for the development of the CSP Plant. However, there was only a 2 point difference between the score of Site 1 and Site 2 and therefore both sites could have been recommended for further study in the Environmental Impact Assessment Phase.

• **Technical and Economic Criteria**

In order to provide a balanced approach to the site selection process, the technical and economic criteria which play a role in the selection of a site were also included within the overall evaluation of the candidate sites. The inclusion of the technical and economic criteria in the site selection process stems from the BATNEEC (Best Available Techniques not entailing excessive costs) principle. This principle introduces the need for a development to be technically and economically feasible in addition to being environmentally feasible. In this way the site recommended for detailed study within the Environmental Impact Assessment is acceptable from all aspects of the environment, namely natural, social and economic environments, thereby ensuring that the project strives to embrace the principles of sustainable development. The relative ratings for the technical and economic criteria considered within the Environmental Scoping Study are outlined in Table 5.4.

Table 5.4: Technical and Economic criteria

Criteria	Site 1	Site 2	Site 3
Technical			
Existing roads	4	2	1
Existing Transmission lines and electrical infrastructure	3	5	1
Future Transmission lines	5	3	1
Technical support	5	1	1
Airport	5	1	1
Board and lodging	4	1	1
Water supply	4	1	2
Total	30	14	8
Preference Rating	5	2	2
Economic			
Economic Criteria	5	2	2
Preference Rating	5	2	2

• **Combined Matrix**

In order to evaluate the sites in terms of environmental and technical/economic factors, the alternative sites were weighted against one another taking all the identified environmental, social and technical issues into consideration. This data was used in a combined matrix (Table 5.5). This matrix ranked the alternative sites in terms of environmental and technical factors, and the option with the highest score was considered to be the most favourable alternative.

Table 5.5: Environmental, social and technical criteria matrix

Criteria	Weighting	Unweighted			Weighted		
		Site 1	Site 2	Site 3	Site 1	Site 2	Site 3
Biophysical Criteria							
Soil	1.6	3	4	3	4.7	6.3	4.7
Fauna and Flora	2.3	4	3	3	9.0	6.8	6.8
Avifauna	2.2	4	5	1	8.8	10.9	2.2
Surface Water	1.6	4	4	4	6.3	6.3	6.3
Ground Water	1.7	3	3	2	5.1	5.1	3.4
Social Criteria							
Heritage	1.7	4	4	4	6.8	6.8	6.8
Social Impact	2.6	4	2	3	10.5	5.3	7.9
Land use	1.5	3	4	3	4.5	6.0	4.5
Noise	1.7	4	3	2	6.8	5.1	3.4
Tourism	1.8	2	3	4	3.5	5.3	7.0
Visual	2.4	2	4	4	4.9	9.8	9.8
Technical and Economic Criteria							
Economic Criteria	1.0	5	2	2	5.0	2.0	2.0
Technical Criteria	1.0	5	2	2	5.0	2.0	2.0
Total Score		47	43	37	80.6	77.3	66.5

In terms of the above combined matrix table Site 1 would be recommended for further study in the Environmental Impact Assessment Phase.

5.4. Sensitivity Mapping and Footprint Analysis

A qualitative sensitivity mapping exercise was undertaken during the Environmental Scoping Study. This mapping exercise divided the land covered by the farms into a number of different categories (ideal, acceptable and not ideal). The sensitivity mapping was undertaken by each specialist during their individual studies. The sensitivity maps for the individual specialist studies were overlaid and utilised to create a sensitivity index (Figure 5.1) and sensitivity zoning (Figure 5.2) for each site.

The sensitivity analysis was originally undertaken in order to identify areas within each farm that would be suitable for the placement of the CSP Plant with regards to the resultant environmental impacts. However, due to the closeness of the matrix results it was decided to utilise the sensitivity analysis for clarity on whether any of the site show a more suitable setting for the CSP Plant. The mapping showed that although Site 2 has more area that is considered to be ideal, Site 1 has more area that falls within the acceptable to ideal range than any other site.

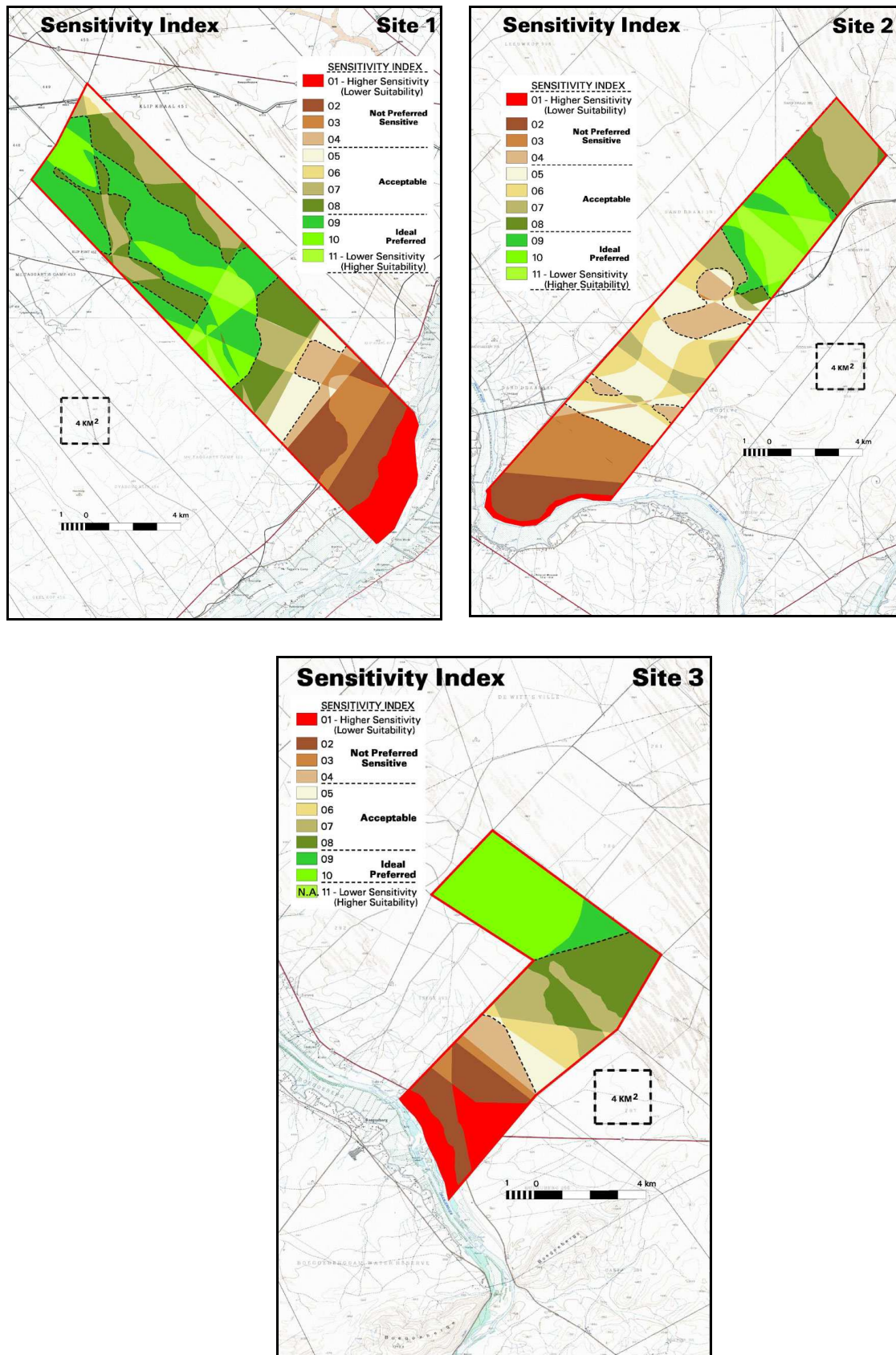


Figure 5.1: Sensitivity Indexes – Site 1, 2 and 3

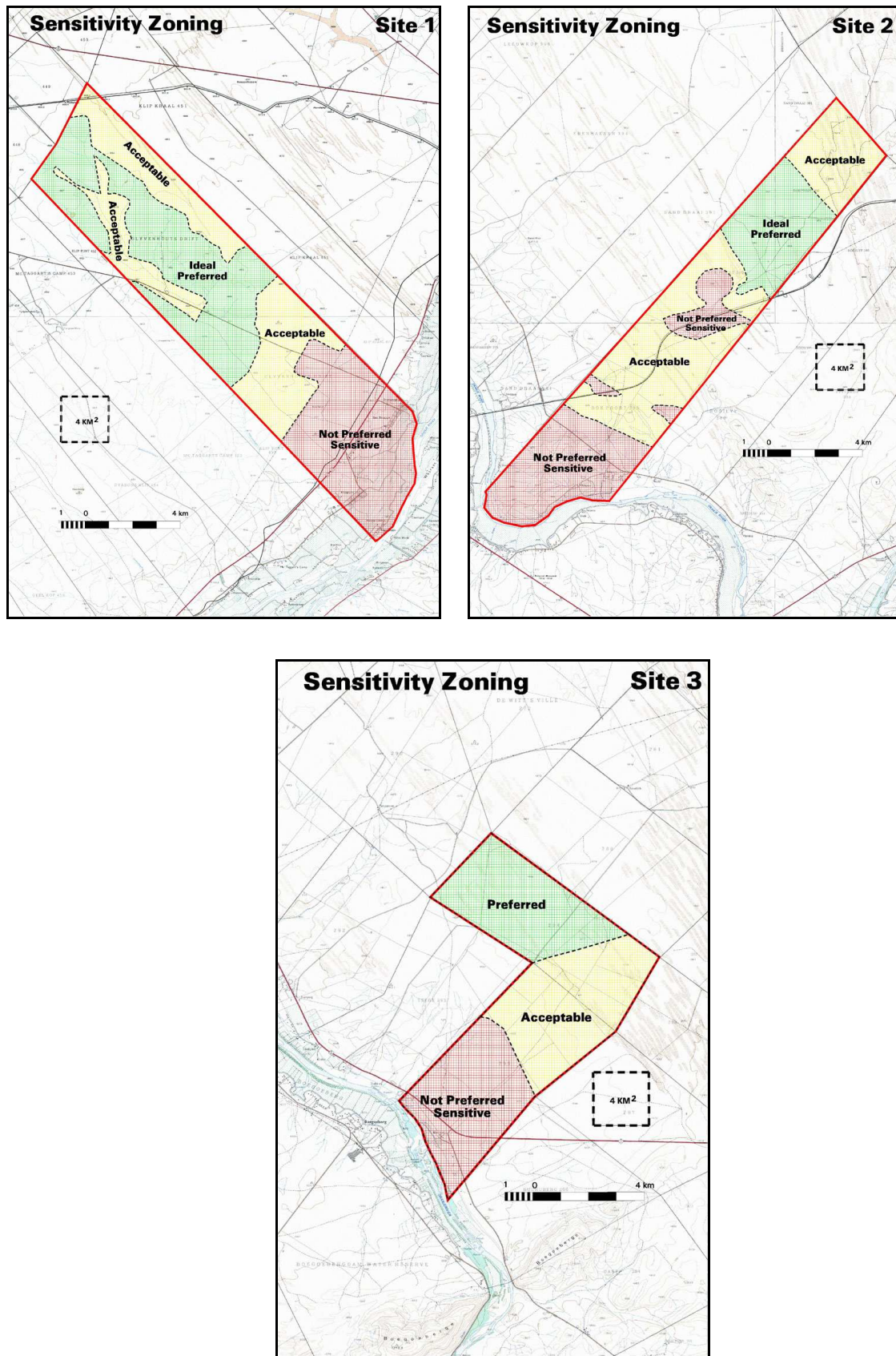


Figure 5.2: Sensitivity Zoning – Sites 1,2 and 3

5.5. Overall Conclusion and Recommendation

Based on the specialist studies no environmental fatal flaws were identified as a result of the proposed project on any of the sites evaluated. However, a number of potentially significant environmental impacts were identified as requiring further in-depth study.

Therefore, an EIA was required to be undertaken in order to provide an assessment of these potential impacts and recommend appropriate mitigation measures, where required.

The EIA was undertaken for the preferred site. In the consideration of the environmental and social criteria along with the technical and economic criteria and sensitivity mapping, the nominated site for further study was Site 1 (Olyvenhouts Drift).