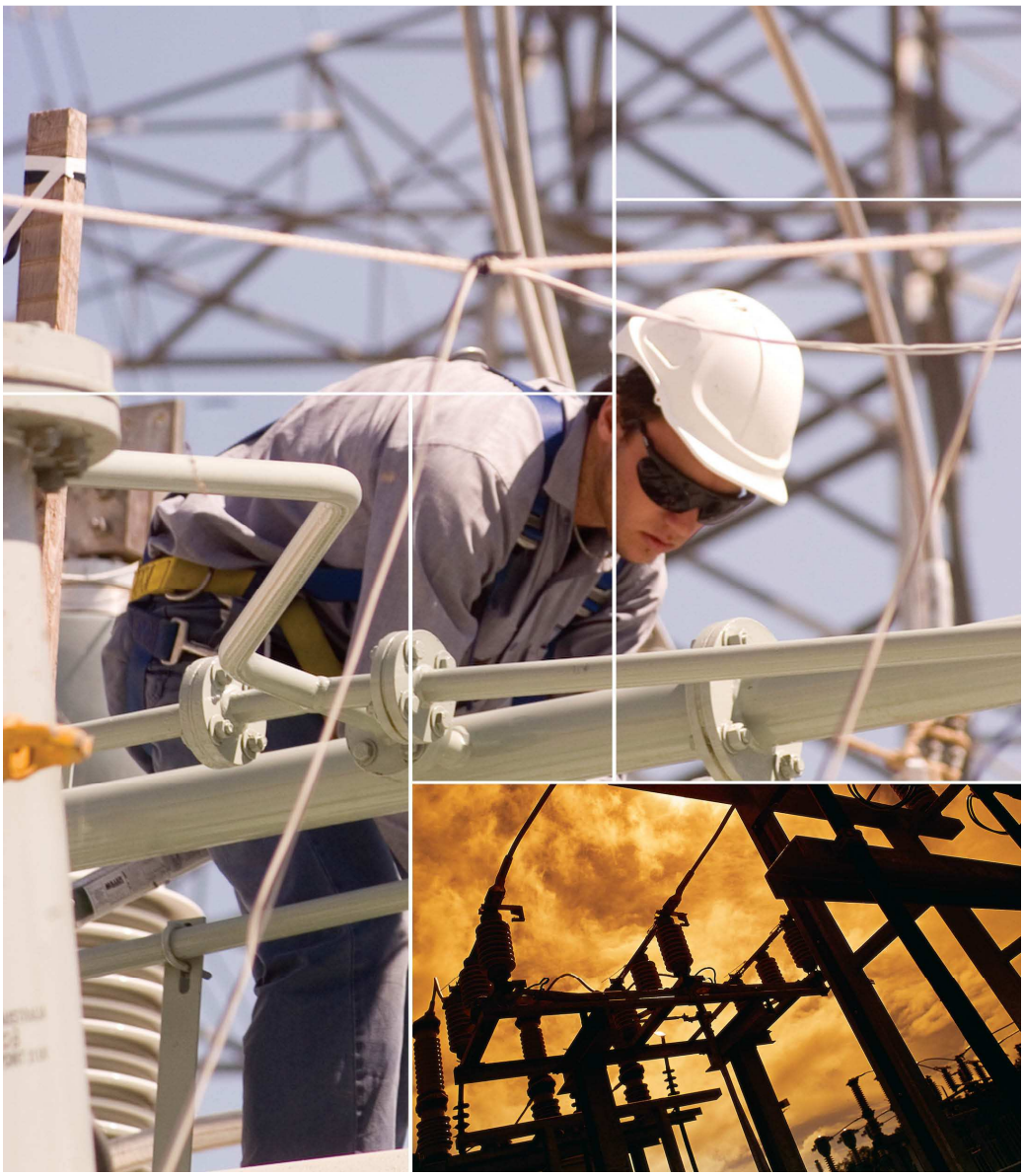

EIA FOR A 200MW PHOTOVOLTAIC ENERGY FACILITY PROPOSED FOR SIBANYE GOLD, WEST WITWATERSRAND, GAUTENG

SITE ALTERNATIVES ASSESSMENT (USING A MULTI-CRITERIA DECISION-MAKING MODEL)

Revision 3: 15 March 2016

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SibanyeGOLD

Submitted by Aurecon South Africa (Pty) Ltd

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ACRONYMS AND DEFINITIONS

CBA	Critical Biodiversity Area
Distribution	In the context of electrical infrastructure, 132Kv and below
EIA	Environmental Impact Assessment
ESA	Ecological Support Area
ha	Hectare
FWRDWA	Far West Rand Dolomitic Water Association
km	kilometre
kV	kiloVolt
MCDM	Multi-criteria Decision-making
MW	MegaWatt
NEMA	National Environmental Management Act, 1998 (Act No. 107 of 1998)
NFEPA	National Freshwater Ecosystem Priority Area
NHRA	National Heritage Resources Act, 1999 (Act No. 25 of 1999)
PV	Photovoltaic
PWV	Pretoria-Witwatersrand-Vereeniging
Transmission	In the context of electrical infrastructure, more than 132kV

1 INTRODUCTION

Sibanye Gold (Pty) Ltd (Sibanye Gold) endeavours to develop a 200 Megawatt (MW) Photovoltaic (PV) energy facility as an alternative supply of energy to Eskom to supply its mines. Sibanye Gold identified three potential sites near Westonaria, West Witwatersrand, in the Gauteng Province for the proposed development.

Aurecon South Africa (Pty) Ltd (Aurecon) was appointed to undertake a site selection screening study as part of the requisite Environmental Impact Assessment (EIA) process in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA) in order to determine the most suitable site or combination of sites. This report describes an initial high level screening of the three alternative sites for the proposed 200 MW PV facility. The remainder of the report is arranged as follows:

- Section 2 provides a brief overview of the purpose of this assessment;
- Section 3 describes the three sites that will be subjected to the site selection process;
- Section 4 describes the methodology employed and the criteria selected to inform this assessment;
- Section 5 provides a detailed description of the findings based on the various criteria;
- Section 6 provides a summary of the report followed by a sensitivity an analysis to test the accuracy of the findings; and
- Section 7 concludes the report.

2 PURPOSE OF THE ASSESSMENT

The identification and consideration of alternatives is a fundamental requirement of the principles of the NEMA and the requirements of the EIA Regulations identify the assessment of alternatives as one of the steps to be undertaken early in project development. Alternatives are typically considered at various stages during the development.

The aim of this assessment is to identify the site/s most suitable for detailed assessment in the EIA in a transparent and defendable manner. By undertaking a pre-EIA site selection process, it ensures that resources employed during the EIA process are focussed on site/s that is/are feasible in terms of technical (including financial), biophysical and social considerations, rather than doing equally detailed studies on a variety of sites that may not meet certain essential criteria for functioning, for one or more reasons.

The purpose of this assessment is also to provide valuable insights to the limitations and benefits of the sites that will proceed to EIA stage.

3 ALTERNATIVES

Sibanye Gold plans to develop a 200 MW PV facility. This facility would be developed in phases with an initial phase of 50 MW anticipated to be operational by the end of 2017. Generally a 200 MW PV facility would require a footprint area of approximately 600 ha (based on a calculation of 3 ha per MW). This ratio was considered during the site selection process to allow for contingencies, although estimates as low as 2 ha per MW have been suggested.

Sibanye Gold identified three sites for the proposed facility based on the following main criteria:

- Land availability and ownership;
- Size of the land; and
- Distance to existing substations, in particular the Libanon, Midas and East Drie Gold Substations.

Based on the above, the three sites proposed for the PV facility vary in size and are located on various portions of land. The sites identified belong to the Far West Rand Dolomitic Water Association (FWRDWA) of which Sibanye Gold is a member.

Table 1 | Details of the three proposed sites

Site	Property details	Size
Site 1 - blue area in Figure 1	Located on Farm Uitval 280 (portions 1, 2, 4, 5, and 6) immediately north of road R501.	approximately 851 ha
Site 2 - yellow area in Figure 1	Farm Uitval 280 (portions 8, 9, 10 and 11) immediately south of the R501.	approximately 775 ha
Site 3 - red area in Figure 1	Farm Leeuwpoort 356 (portions 70 and 71), and Farm Doornkloof 350 (portion 5) located to the north of the National Road N12.	approximately 622 ha

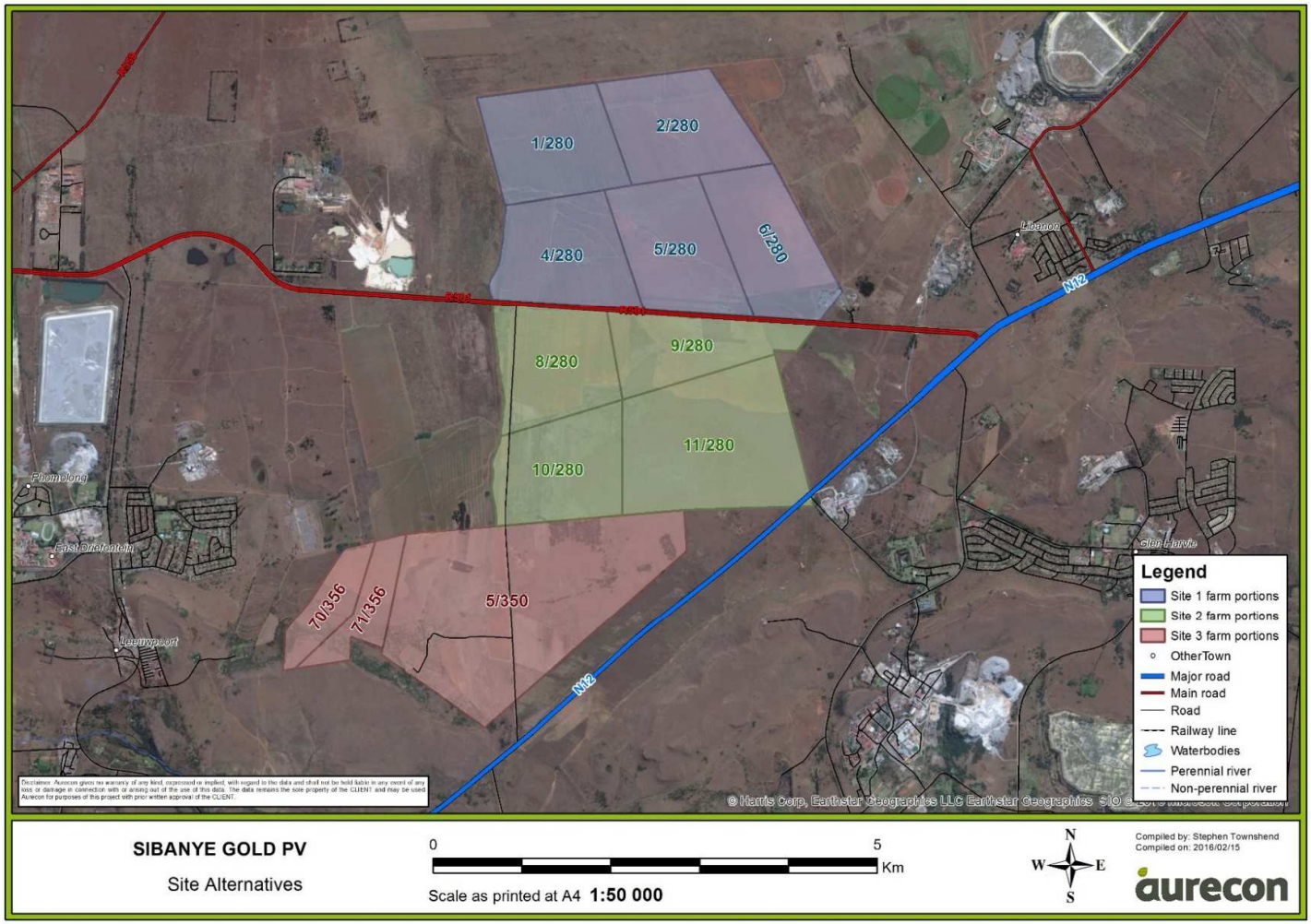

Figure 1 | Three alternative sites identified for the proposed PV facilities for Sibanye Gold

4 MULTI-CRITERIA DECISION-MAKING METHODOLOGY

The MCDM model is an open, transparent and interactive process that can be used for optimal site selection based on the major issues that will influence the viability and suitability thereof. MCDM is a discipline aimed at supporting decision-makers who are faced with making numerous and potentially conflicting facts. It highlights conflicts and derives a way to reach a recommendation in a transparent process. This process is well-suited to address complex technical strategic planning challenges, and is typically required in an alternatives assessment, since the MCDM prioritises options against a set of predetermined criteria.

In a typical MCDM model, options could typically include project, technology, biophysical and sequencing alternatives. However, the MCDM process is not designed for fatal flaw identification and thus only feasible alternatives should be considered. The site alternatives considered in the MCDM are described in Section 3.

Although several MCDM models are available internationally, not all are ideal for this specific category of application. The model used in this process allowed for the comparison of sites based on the weighted rating per criterion, providing an overall percentage per site. The advantages of this model, in an application such as the selection of sites for development, include the following:

- It allows for testing of the consistency and sensitivity analysis of the rating;
- It allows for a degree of difference in interpretation of the rating scale by the various team members or specialists looking at the different aspects; and
- Its ease of use and transparency in a simple spreadsheet format.

4.1 MCDM Methodology

The selected MCDM model requires that pre-selected alternatives be identified, as described in Section 3 of this report, and evaluated against performance criteria and sub-criteria, as described in Section 4.2. The sites were then scored out of five for each sub-criterion. A rating scale as indicated below is used to compare the alternatives:

1- Fatal Flaw (lowest level of suitability);
2- High Impact;
3- Moderate Impact;
4- Low Impact; and
5- Insignificant impact (highest level of suitability).

All sub-criteria were rated without considering mitigation measures. A low rating means a weak preference and a higher rating means a stronger preference.

Each of the main criteria (technical, biophysical environment and social environment) were divided into a number of sub-criteria, each of which was then weighted to account for a specific portion of the main criteria. The base case was weighted as follows:

- Technical: 33%;
- Biophysical: 34%; and
- Social: 33%.

This is deemed a fair weighting scenario for a base case, and variations on this scenario were considered in the sensitivity analysis as described in Section 7. The aim of the sensitivity analysis was to confirm and test the robustness of the outcome. This was informed by data obtained from a desktop

review of available documentation and also a site visit of the three site alternatives as discussed in Section 4.3.

4.2 Criteria for Site Selection

The site selection criteria were chosen based on a broad definition of sustainability, which encompasses the technical (including financial), biophysical and social criteria outlined below. This is to ensure that the approach for development of the proposed PV facility is holistic and integrated.

The criteria were selected based on issues identified by the Sibanye Gold project team and the EIA team, including specialists, and informed by the expert knowledge of these team members. The criteria used in site selection in this process were grouped under three main categories:

- **Technical:** This is related to the impact that the site conditions will pose with regard to technical function, cost and efficiency. It also assesses the potential of each site to support a PV facility in terms of the land and infrastructure currently available (such as proximity to existing transmission lines and substations, access roads, continuity/fragmentation of the available area, topography of the site and its effect on solar radiation, and geotechnical stability). As the type of technology to be used would be the same for each site, this was not considered to be a differentiating criterion and was therefore not considered. Although financial considerations are not explicitly mentioned in this category, they are closely related to the technical aspects and technical issues can therefore be regarded as a proxy for financial issues.
- **Biophysical environment:** This component refers to the need to select a site that minimises the risk to ecosystem functioning and biophysical environmental integrity. Therefore, the biotic criteria prioritise the anticipated impacts on terrestrial biodiversity, surface water features and avifauna.
- **Social environment:** This component considers how each site is affected in terms of social impacts on the surrounding communities and users of the land (including tenants) and potential visual impacts. It further considers heritage resources, the change in land use and the loss of agricultural use of the land.

While there are a number of criteria that need to be considered in the EIA process when assessing the significance of impacts related to the proposed PV facilities, only criteria that could differentiate one site against another were considered in this comparative process. After undertaking the site visit and during the site selection workshop, a number of sub-criteria were rated equal due to: a) non-differentiating aspects or factors between the sites, and/ or b) limited available information related to these particular sub-criteria at this stage in the project. These equally rated sub-criteria have not been excluded from the MCDM process. However, a scenario excluding these criteria has been included in Section 7 of this report to determine how this influences the outcome.

Several criteria were initially considered but excluded from the MCDM process because they were no longer applicable or did not significantly influence the feasibility of the sites. The excluded sub-criteria are listed in Table 2. The final sub-criteria considered in the MCDM process are listed in Table 3.

Table 2 | Reasons for excluding certain criteria

TECHNICAL CRITERIA		REASON FOR EXLUSION
T5	PROXIMITY TO WATER SOURCES – Availability of water for maintenance of PV panels	Excluded, because water for maintenance purposes/ washing of the PV panels will be trucked in to the site as and when required. Therefore, proximity to water sources is no longer applicable.
T7	SHADOW EFFECT – The significance of the shadowing effect of the transmission lines on the sites	Excluded, because the shadow effect from the existing power lines can be mitigated by buffering the transmission lines by a reasonable distance from the power line servitudes. A total buffer of 100 m (50m on each side from the centerline of the pylons) has been applied to the power line servitudes.
T8	SLOPE ANALYSIS – Impact of the slopes on available solar radiation and energy yield	Excluded, because slopes on the sites are not considered steep enough to have a significant effect on solar yield. In addition, the PV facility can be designed in such a way as to mitigate the effect of slopes, for example by making use of single axis tracking PV technology and spacing the panels further apart.

Table 3 | Criteria for site selection

CRTIITERIA AND SUB-CRITERIA		BASE CASE WEIGHTING	SPECIALIST THAT RATED THE CRITERION
TECHNICAL CRITERIA			
T1	GEOTECHNICAL STABILITY – Risk of subsidence due to dolomitic conditions, including the focus on potential loads of PV infrastructure	13.2%	Janet Bunk (Aurecon) and Greg Heath (Sibanye Gold)
T2	EASE OF GRID CONNECTION – Proximity to existing grid infrastructure and the ease of integration	6.6%	Dries Mouton (Aurecon)
T3	CONTINUITY OF AVAILABLE AREA – Location of services/ infrastructure and associated servitudes, as well as other factors, which can result in fragmentation of the sites	6.6%	Reuben Heydenrych (Aurecon)
T4	ROAD ACCESS – Ease of establishing access to the site	4.95%	Vera Mpofu (Aurecon)
T5	SOLAR RADIATION – The effect of topographic shadowing on the potential solar radiation	1.65%	Ashley Grohn (Aurecon)
	Total Technical Weighting	**33%**	
BIOPHYSICAL CRITERIA			
B1	TERRESTRIAL BIODIVERSITY – Impact on areas of high plant and terrestrial animal biodiversity, including conservation-important or	13.6%	Emile van der Westhuizen (SAS Environmental)

	red data species, and the habitat of these species		
B2	WETLANDS - Potential impact on National Freshwater Ecological Priority Areas or other confirmed wetlands	11.9%	Emile van der Westhuizen (SAS Environmental)
B3	AVIFAUNA - Potential impact of facility and associated infrastructure on avifauna, especially conservation-important or red data species	8.5%	Emile van der Westhuizen (SAS Environmental)
	Total Biophysical Weighting	**34%**	

SOCIAL CRITERIA			
S1	AGRICULTURE - Loss of agricultural use	13.2%	Piet Steenekamp (Rehab Green)
S2	LAND USE CHANGE – Potential for zoning restrictions since land is currently zoned for agricultural purposes	6.6%	Marietjie Van Zyl (Aurecon)
S3	HERITAGE - Impact on heritage and palaeontological resources	6.6%	Jennifer Kitto (PGS Heritage)
S4	VISUAL IMPACT - Impact on sense of place, with specific reference to visual sensitivity	6.6%	Elmie Weideman (Aurecon)
	Total Social Weighting	**33%**	

4.3 MCDM workshop

A one day site visit and Multi-Criteria Site Selection Workshop was undertaken on 5 and 6 August 2015 respectively, to collect the necessary information and objectively determine the preferred site for the proposed PV facility.

The aim of the site visit was to confirm desktop findings to determine the *status quo* and identify any sensitive features or natural resources at the sites that could be negatively affected by the proposal. The Multi-Criteria Site Selection Workshop was a forum for discussion amongst the project team where specialist and professional input was given with regard to the following:

- The technical aspects of the proposal;
- Biophysical and social considerations;
- Any fatal flaws observed on site;
- Threats to and opportunities that exist for the proposal; and
- Any legal aspects that may hamper the proposed development or its authorisation.

The project team involved in the high level screening exercise is indicated in Table 4.

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Table 4 | MCDM team members

Field of expertise	Name	Company name
MCDM facilitator	Reuben Heydenrych	Aurecon
Biodiversity	Emile van der Westhuizen	SAS Environmental
Soil and Agriculture	Piet Steenekamp	Rehab Green
Water Use Licenses	Hennie Pretorius	Sibanye Gold
Heritage	Jennifer Kitto	PGS Heritage
Technical issues	Dries Mouton Jevon Martin Ben Potgieter	Aurecon Sibanye Gold Sibanye Gold
Project Management	Andrie Roelofse	Top Quartile
Geotechnical suitability	Greg Heath Janet Bunk	Sibanye Gold Aurecon
Traffic	Vera Mpofu	Aurecon
Planning	Marietjie Van Zyl	Aurecon
Visual impact	Elmie Weideman	Aurecon
Environmental (client)	Tharina Naudé Nico Gewers	Sibanye Gold
Environmental Consultants	Karen de Bruyn Kim White	Aurecon

Input into the process was based on the following:

- Desktop review of available information of the project and area;
- Discussions with Sibanye Gold and selected stakeholders;
- Site visit to each site; and
- Expert knowledge, based on qualifications and experience.

The MCDM workshop was held over a day in Roodepoort in Gauteng, one day after site visits had been completed. Following the individual assessment of relevant criteria by the relevant members of the project team, findings were presented and debated with the entire team. Where required after discussion, findings were refined. The section below is a summary of the assumptions and evaluations of each specialist. The individual inputs are presented in Section 5, with the integrated findings presented in Section 6. Feedback is grouped per criterion and presented per site.

Each discussion was concluded with a summary table to indicate the level of preference expressed as percentages (the larger the difference in percentage the larger the difference in preference).

5 FINDINGS

This section of the report presents the findings of the MCDM workshop. The biophysical, social and technical sub-criteria rated at the workshop are discussed in detail below. Sensitive features identified on the sites are indicated **Figure 2** and discussed below.

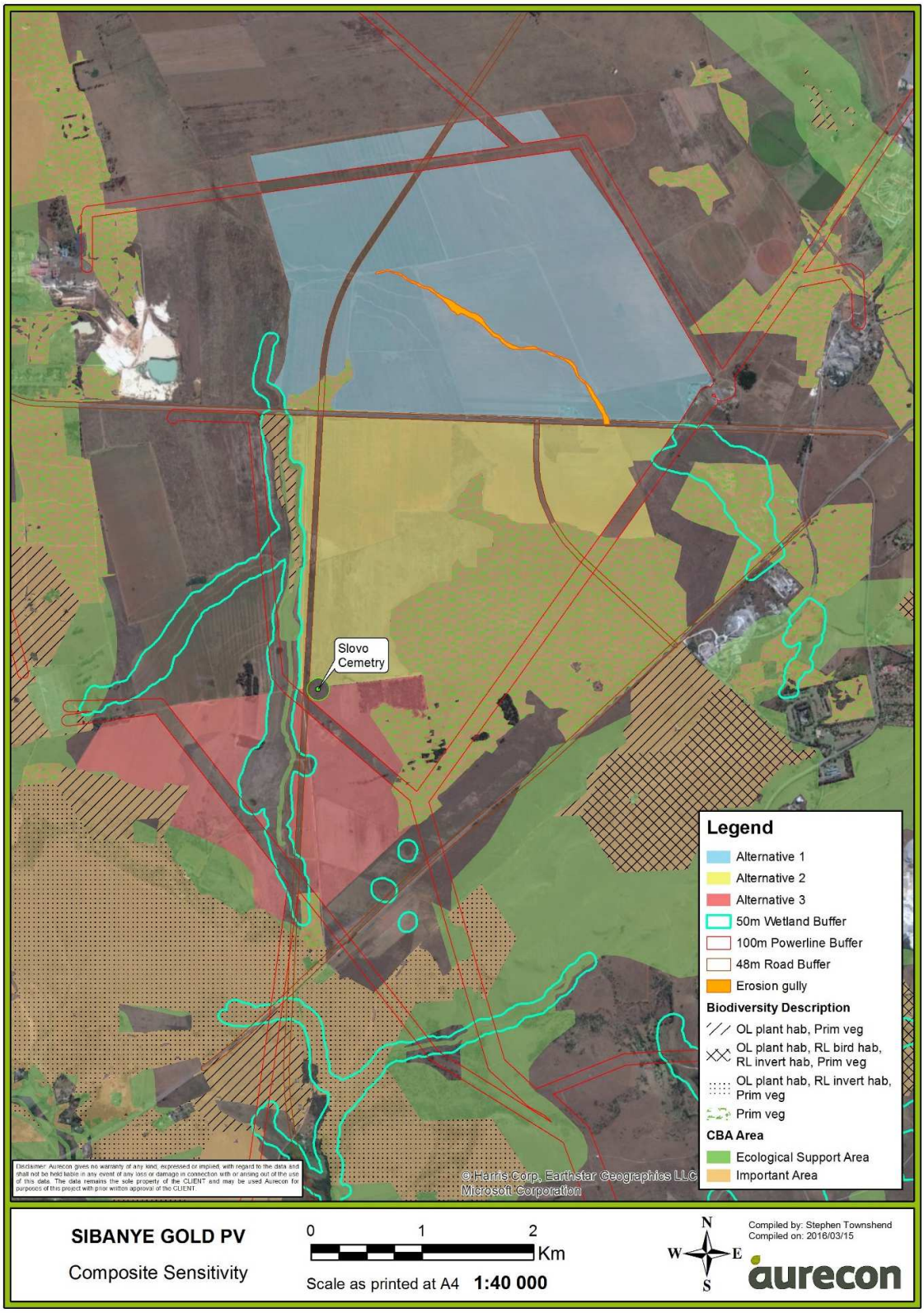


Figure 2 | Services, infrastructure, sensitive features and buffers for the three sites

5.1 Input to Biophysical Criteria

Environmentally sensitive areas are land and water areas containing natural features or ecological functions of such significance to warrant protection to avoid detrimental impacts on biodiversity. To ensure that the development of these sites does not have detrimental impacts on biodiversity, three sub-criteria were selected to assess this. Each of the sub-criteria have a specific weighting adding up to a total of 34% as indicated in Figure 3. Each of the three sub-criteria are described below.

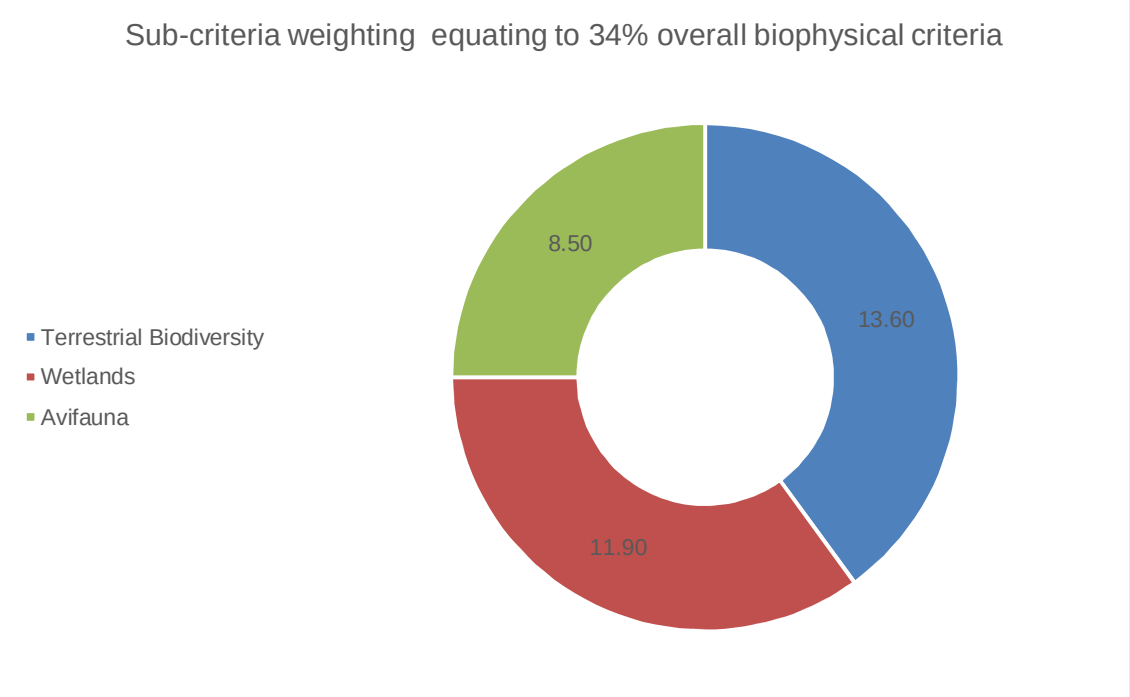


Figure 3 | Split of biophysical criteria

5.1.1 B1 Impact on areas of high terrestrial biodiversity

This sub-criterion considers species diversity, taking into account numbers of species of conservation importance and the habitat for these species. The desktop assessment confirmed that the proposed site alternatives are not located in close proximity to protected areas and have not been earmarked for future potential expansions of protected areas. Sensitive habitat features are present on the sites including wetland areas considered in B2, undisturbed areas and ridges. Ridges provide vital habitat for many threatened, rare and endemic species of fauna and flora and therefore these areas are mapped as Critical Biodiversity Areas (CBAs) with associated Ecological Support Areas (ESAs) by the Gauteng Department of Agriculture and Rural Development (GDARD).

This sub-criterion accounted for 13.6% of the biophysical criterion.

5.1.1.1 Assumptions

The evaluation of this criterion was influenced by the following assumption:

- A desktop review was sufficient to inform the ratings of the sites and would not result in a biased outcome of the MCDM process;
- Disturbed areas (e.g. previously ploughed areas) are unlikely to support species of conservation concern; and

- Sensitive features on site (drainage lines and watercourses, undisturbed areas and ridges) provide unique habitats to species occurring in the areas.

5.1.1.2 Discussions

Site 1 comprises agricultural land and is already disturbed. No species of conservation importance are likely to occur on the site. Since Sites 2 and 3 are located adjacent to one another and their species composition is likely to be relatively similar across the area. Sites 2 and 3 are predominantly used for agriculture as discussed under S1. However, Site 2 includes a ridge in the south eastern region of the site (Figure 2). This ridge is rocky and undisturbed and is mapped as an Important Area of a CBA (GDARD, 2014). This ridge provides a high degree of valuable terrestrial biodiversity, habitat and connectivity.

Similarly Site 3 includes a ridge, which is in fairly good condition and is mapped partly as a CBA, particularly an Important Area, and partly as an ESA. Site 3 also includes a wetland area (Figure 2), which bisects it from south to north. Thus, it is very likely that Site 3 contains some species of conservation importance and that the site provides a high degree of terrestrial biodiversity, habitat or connectivity.

In order to support the species occurring in the area, sensitive habitat features such as the wetland areas, undisturbed areas and ridges should be avoided as far as possible and an appropriate buffer implemented.

Site 1 was strongly preferred (11%) over Site 2 and Site 3 (each rated as 5%) pre-mitigation.

5.1.2 B2 Potential impact on wetlands

Surface water features such as rivers, drainage lines, pans and wetlands are considered to be sensitive ecological features. In addition to these features being important from a biophysical point of view, it is also crucial to exclude them from development areas from a technical point of view. Flash floods could dislodge panels or damage infrastructure. All three sites contain wetland areas. A Wetland Assessment was compiled by Digby Wells and Associates (South Africa) (Pty) Ltd (Digby Wells) in October 2015 for Sibanye Gold's West Rand Tailings Retreatment Project. This assessment provides wetland delineations for the study area, but not specifically for the PV site, as it focused on wetlands within close proximity of the proposed pipelines for the tailing facility. Thus, the Digby Wells report assessed the wetland in Site 1 only within 250m north of the R501 on Site 1.

It is recommended that a buffer of at least 50 m be applied, where possible, from the boundaries of any watercourses or wetlands. The buffer zones would be considered "No-Go" areas, meaning no development could take place within those areas, thereby reducing the area available for development. Should the 50 m not be possible, a Water Use License Application (possibly in the form of a General Authorisation) will be submitted to the Department of Water and Sanitation and sufficient stormwater management measures will need to be implemented.

This criterion does not consider water contamination as a primary concern, but rather the physical disturbance of these sensitive areas.

Potential impact on wetlands accounted for 11.9% of the biophysical criterion.

5.1.2.1 Assumptions

The evaluation of this criterion was influenced by the following assumptions:

- Since all three proposed sites contain wetland areas, Water Use License applications would be required for approval on each of these sites.
- Constructing around drainage features would make the PV layout and cable routing more complex (since it is assumed that no construction would be permitted in this area); and
- A buffer of 50 m, where practically possible, would be sufficient to contain a 1:100 year flood.

5.1.2.2 Discussions

Site 1 contains a drainage line which originates at the R501 and extends to the north western boundary of the site. Although this drainage line is mapped as a wetland in the Digby Wells Wetland Assessment, there are isolated signs of wetland soils and is therefore considered to be a drainage line that is already highly disturbed. This drainage line is mapped on Site 1.

Site 2 is located between two wetland areas: A larger wetland area borders the western boundary of the site and a smaller wetland area borders the north eastern corner of the site. The wetland to the east is not mapped as a National Freshwater Ecosystem Priority Area (NFEPA) wetland, but should be buffered and excluded from development. The wetland to the west of the site is mapped as a Natural Wetland. More specifically is it classified as a Depression Wetland under the Dry Highveld Grassland Group 5 wetland ecosystem type[1], which is classified as Least Threatened and Not Protected (Nel & Driver, 2012). Construction of the proposed PV facility on Site 2 would result in limited disturbance and potential loss of the actual wetland but would fall within and affect the wetland buffer.

Site 3 contains a wetland area, which is in fairly good condition. This wetland area is the upstream portion of the wetland adjacent to Site 2. This wetland area is not mapped as a National Freshwater Ecosystem Priority Area (NFEPA) wetland, but it is mapped as an Artificial Wetland which is classified as a Seep Wetland under the Dry Highveld Grassland Group 5 wetland ecosystem type[1], which is classified as Endangered and Not Protected (Nel & Driver, 2012). Construction of the proposed PV facility on Site 3 would potentially result in the disturbance and loss of a large portion of the wetland and wetland buffers.

Although Site 1 has a drainage line with isolated signs of wetland soils, this drainage line is highly degraded (being completely transformed by cultivation), with very little natural vegetation. This drainage line could be included in PV panel layout area with minimal impact. Site 1 is strongly preferred over the other site alternatives. Site 2 is preferred (10%) to Site 3 (5%) due to the fact that the wetland area is not within the proposed Site 2 boundaries, as is the case with Site 3.

5.1.3 B3 Potential impact on avifauna

A number of potential impacts on avifauna could result from the construction, operation and decommissioning phases of PV facilities. These impacts include:

- Disturbance and displacement of seasonal influxes of large terrestrial birds from nesting and/or foraging areas;
- Mortality from birds colliding with new power lines while flying between resource areas;
- Disturbance and displacement of resident or visiting raptors from foraging areas;
- Electrocution of large birds when perched on power infrastructure;

[1] Wetland ecosystem types are used by NFEPA to group wetland with similar functionality and ecological characteristics together.

- Injury or mortality of wetland birds when using possible flight lines in and out of resource areas in the broader vicinity (resulting from collisions with the PV infrastructure or associated new transmission line);
- Permanent habitat loss for some avifauna species; and
- Displacement of terrestrial species from a broader area, either temporarily or permanently, by construction and maintenance activities.

The potential impact on avifauna accounted for 8.5% of the biophysical criterion.

5.1.3.1 Assumptions

The evaluation of this criterion was influenced by the following assumptions:

- It is assumed that sites with existing transmission lines would have a less significant impact on avifauna since the area is already affected; and
- Sites that include ridge areas, undisturbed habitats, drainage lines and/or wetland areas would be preferred by birds over sites with no unique habitats and hence would be more sensitive to the proposed development.

5.1.3.2 Discussions

Based on a desktop review of previous studies in the area, two potentially sensitive avifaunal species are known to occur in the general site area. These include *Tyto capensis* (African Grass-owl) and *Sagittarius serpentarius* (Secretary Bird). These species are listed as Least Concern and Vulnerable, respectively, on the International Union for Conservation of Nature and Natural Resources Red List of Threatened Species (BirdLife International, 2013).

Based on a desktop assessment it was determined that Site 1 may be used for foraging by avifaunal species, but the site does not contain suitable habitat for breeding of avifaunal species due to the fact that it is predominantly agricultural fields.

The ridge area in the south eastern region of Site 2 is suitable breeding and foraging habitat for *S. serpentarius*. Other avifaunal species of conservation concern such as *T. capensis* may also be attracted to the wetland area and adjacent grassland to the west of the site.

As with Site 2, Site 3 includes a wetland area which is preferred by *T. capensis* for foraging and breeding, and a ridge in the south western region of the site which may be utilised by *S. serpentarius* for foraging purposes.

Overall, Site 1 was preferred (7%) over Site 2 and 3 (equally rated as 3%) as a result of the lack of unique habitats found on Site 1. Sites 2 and 3 are equally less preferred since they comprise sensitive ridges (mapped as CBAs) and wetland areas which are suitable for breeding and foraging.

5.2 Input to Socio-economic Criteria

The social criteria consisted of four sub-criteria each with a specific weighting adding up to a total of 33% as indicated in Figure 4. Each of the four sub-criteria are described below.

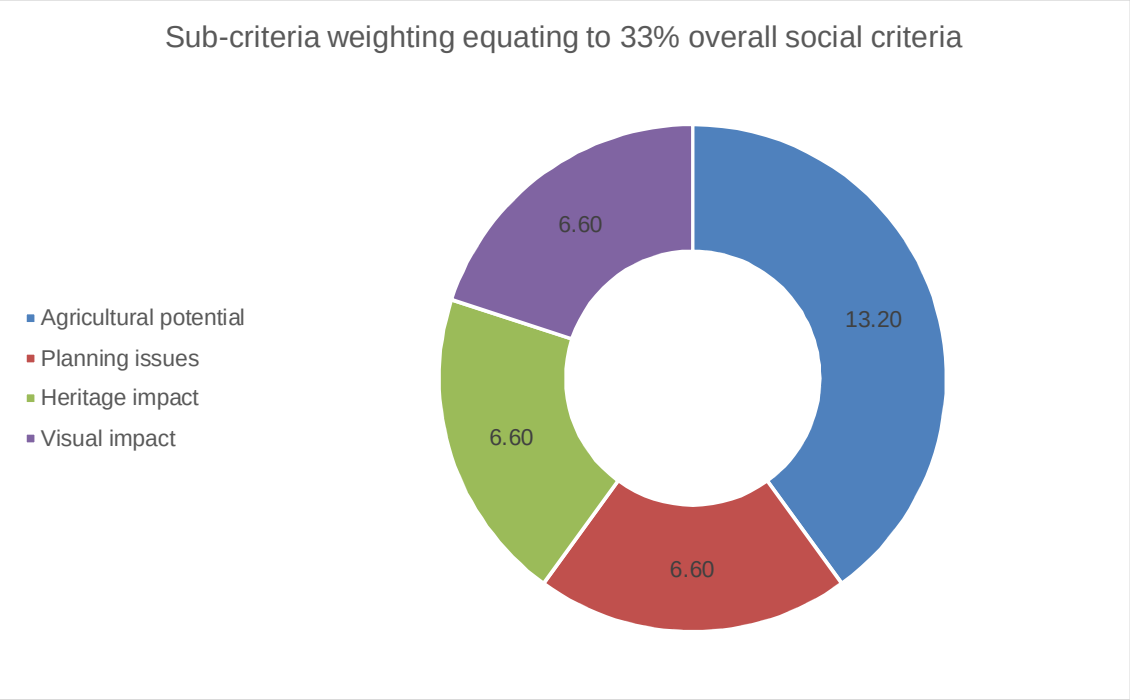


Figure 4 | Split of social criteria

5.2.1 S1 Loss of agricultural potential

The areas investigated are all currently used, either predominantly or partially, for agriculture. Dryland crop production, specifically maize, is undertaken on Site 1 and in the northern region of Site 2. The small south eastern area of Site 3 is used for crop production, while the western region is used for livestock farming.

All sites are located outside of the Gauteng Agricultural Hubs, specifically just south of West Rand hub and far north of the Emfuleni hub. The assessment of agricultural potential is based on current land use of the sites and not on an intrusive soil assessment.

Although the sites are located outside of the Agricultural Hubs, some opposition can be expected from the Department of Agriculture, whose mandate is to mitigate the loss of agricultural land with a high production potential. This potential delaying aspect of the project was considered and accounted for 13.2% of the 33% social criteria.

5.2.1.1 Assumptions

The evaluation of this criterion was influenced by the following assumptions:

- Only agricultural potential loss in terms of dryland maize farming was considered;
- All high potential land is currently used for cultivation and uncultivated land has low(er) potential; and
- The long-term production yields of sites 1 and 2 range between 4-6 tons per ha per annum based on a conversation with the farmer currently leasing the land.

5.2.1.2 Discussions

The majority of Site 1 is being used for maize production (refer to Table 5). The development of a PV facility at Site 1 would result in the loss of agricultural land used for maize production and was therefore least preferred (5%).

The northern half of Site 2 is dominated by assumed high agricultural potential soils. The remainder of the site comprises the ridge area, which is undisturbed. The loss of agricultural land at Site 2 was rated as 8%.

Site 3 comprises a small portion of land with assumed high agricultural potential soils. The remainder of the site is disturbed and comprises a farmstead, a cemetery and wetland area. Livestock farming occurs on the westernmost portion of the site.

As a result Site 3 is most preferred (11%) because the area is largely disturbed and uncultivated. Thus there is a limited amount of potential loss of agricultural land at this site.

Table 5 | Loss of agricultural potential discussed at the workshop

Site	Agricultural Area	Total Site Area
Site 1	482 ha	501.5 ha *
Site 2	305.7 ha	695 ha (The area to the west of the gravel road and east of the wetland was excluded from the agricultural potential assessment)
Site 3	56 ha	182.1 ha (The western portion comprising the wetland and farmstead was excluded from the agricultural potential assessment)

* Note: At the MCDM workshop Site 1 comprised Portions 5, 6 and 7 of Farm Uitval, 280. Subsequent to the workshop the size of Site 1 was amended. Portions 1, 2 and 4 have been added and Portion 7 has been removed from Site 1. Thus the figures listed in the Table 5 are not based on the current extent of Site 1. The increased site area does not influence the rating given for Site 1 and remains unchanged.

5.2.2 S2 Zoning restrictions

All three sites are used for agricultural purposes and are currently zoned as “agriculture”. Construction of the PV facility cannot occur until:

- A rezoning application for the change in zoning/land use of the land is submitted to and approved by the Westonaria Municipality in terms of the Land Use Planning Act, 2014 (Act 3 of 2014); or
- A Consent Use is granted by the Westonaria Municipality in terms of the Westonaria Town Planning Scheme.

The planning component (S2) accounted for 6.6% of the 33% social criteria.

5.2.2.1 Assumptions

The evaluation of this criterion was influenced by the following assumption:

- Critical restrictions that require extended lengthy rezoning processes do not apply since the sites are not located within the Gauteng Agricultural Hubs.

5.2.2.2 Discussions

All sites would need to undergo the same land use change process as they all have the same zoning and occur within the same municipal area. Thus all sites were rated equally (5%). The best case scenario with regard to the change in land use zoning is that a consent use for the use of the land is obtained. If a consent use is not obtained then an extended rezoning process would need to be undertaken and this can take up to 18 months for approval to be granted.

5.2.3 S3 Impact on heritage and archaeological resources

The construction of a PV facility could negatively affect heritage resources during site clearing and earthworks. Heritage, archaeological and palaeontological features are protected under the National Heritage Resources Act, 1999 (Act No. 25 of 1999) (NHRA). Although a Heritage Impact Assessment will be undertaken during the EIA process, it was important to consider heritage features that would need to be excluded from the development area to avoid their destruction.

It was recommended that a desktop Palaeontological Impact Assessment be conducted for the proposed sites as there are shale and dolomite, which is potentially fossiliferous. This study has been commissioned but not concluded and will therefore not inform this site selection study.

The impact on heritage and archaeological resources (S3) accounted for 6.6% of the 33% social criteria.

5.2.3.1 Assumptions

The evaluation of this criterion was influenced by the following assumptions:

- Current knowledge of the alternative sites is assumed to provide a sufficient basis for comparison at this stage of the evaluation exercise; and
- Any removal or collection of heritage features would require a permit. Therefore, these features would rather be buffered to be excluded from the development area and avoid the need to apply for permits.

5.2.3.2 Discussions

Site 1 has no obvious surface heritage resources, as the ground is disturbed by agriculture.

Site 2 has no obvious surface heritage resources, as the ground is disturbed by maize production, but the ridge in the south eastern region of the site has a good probability of Iron Age sites on or at the foot of the ridge, with possible isolated Stone Age artefacts and possible historic stone walling.

Site 3 includes a historic farmstead of approximately 15 to 20 buildings. These may be automatically protected depending on their age (buildings older than 60 years are protected under the NHRA), once this has been verified. In addition, approximately 35 to 40 formal and informal graves were identified at the northern border of the site. Some of the dates of the graves are from 1924, 1943, and 1975. There is a possibility of more graves at this site based on the presence of the farmstead. The south western region of Site 3 contains a ridge with the potential of Iron Age artefacts. If this site is pursued, extensive mitigation would be required.

Therefore, Site 1 is preferred to the other sites (7%) followed by Site 2 (4%). Site 3 is least preferred (1%) from a heritage point of view and should not be pursued without mitigation.

5.2.4 S4 Impact on sense of place, with specific reference to visual sensitivity

The potential exists that the proposed PV facility and associated infrastructure would be visible from many kilometers away. PV facilities can detract from the sense of place if poorly placed. The sites are located within an industrial context, comprising mines and processing plants. A PV facility at any of the sites would not result in a stark contrast to the surrounding landscape character.

This sub-criterion was considered nonetheless and accounted for 6.6% of the overall social criteria (33%).

5.2.4.1 Assumptions

The evaluation of this sub-criterion was influenced by the following assumption:

- It was assumed that the existing infrastructure on the sites already detracted from the overall scenic quality of the sites.

5.2.4.2 Discussions

All three sites have a low visual absorption capacity as the landscape and topography offer little screening, for example there are few natural trees (although there are Bluegum plantations on Site 3) and predominantly only low cover vegetation such as grasses. Since the surrounding area of the sites is characterized by mining and the infrastructure is visible, all sites would have moderate visual intrusion. This refers to the compatibility of the project with the particular characteristics and qualities of the receiving environment. Therefore all three sites are rated more or less equally with a slightly higher preference for Site 1 (7%). Site 2 is rated as (5%) and Site 3 as (4%) due to the presence of ridges.

5.3 Input to Technical (and Financial) Criteria

The technical criteria consisted of five sub-criteria each with a specific weighting adding up to a total of 33% as indicated in Figure 5. Each of the five sub-criteria are described below.

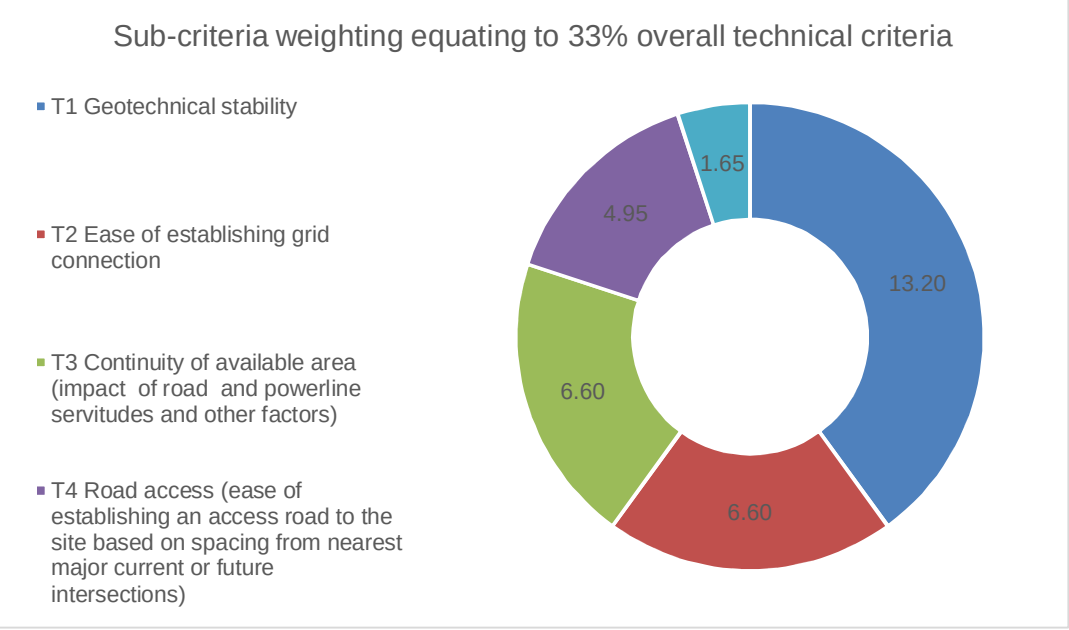


Figure 5 | Split of technical criteria

T1 Risk of subsidence due to dolomitic conditions (geological stability)

The underlying geology of the sites is of great importance because it can have a significant influence on the cost and feasibility of the project. Dolomitic ground covers 25% of the Gauteng Province (Council for Geoscience, 2011) and occurs in large areas of the Far West Rand in and around Carletonville and Westonaria, which are approximately 30 km west and 13 km north east of the proposed sites, respectively. Dolomitic areas are prone to sudden, catastrophic collapse, known as sinkholes, or subsidence. The underlying geology will also determine the type of anchoring foundation structures that would be required to fix the PV mounts to the ground, with a corresponding cost implication.

To ensure that the sites are feasible and to reduce the risks of geological instability, this sub-criteria was considered and accounted for 13.2% of the overall 33% technical criteria.

5.3.1.1 Assumptions

The evaluation of this criterion was influenced by the following assumptions:

- The average depth size of sinkholes in the surrounding area was found to be 20 to 30 m, which is considered a high risk should a sinkhole occur;
- Ground movement events anticipated per ha in a 20 year period (from SANS 1936 Part 1), informed the anticipated likelihood of the risk occurring per site;
- The majority of sinkholes occur because of the dissolution of dolomite as a result of underground water or the infiltration of water from leaking services. It is assumed that the project would be designed in such a way as to mitigate against any ponding of water on site and also operated in such a way that run-off is appropriately managed. Furthermore, the construction of water services on site is not anticipated. Therefore the risk of sinkhole formation from the project would be minimal; and
- Should the construction of the PV facility and on-site substation occur on dolomite, then the infrastructure would need to be designed appropriately and the sinkholes mitigated for.

5.3.1.2 Discussions

Sites 1 and 2 are underlain by dolomite and chert of the Malmani Group, except for inliers of the Karoo Supergroup that are present between Sites 1 and 2, indicated by the small brown areas in Figure 7. Based on the number of historical sinkholes, the potential for sinkholes on Site 1 was considered to be low. The potential for sinkholes on Site 2 was considered to be medium as there are historically more sinkholes than at Site 1. Should sinkholes occur on Site 1 the potential damage of the PV facility would amount to approximately four blocks of PV panels (6% of the total area). Should sinkholes occur on Site 2 the potential damage of the PV facility would amount to approximately 12 blocks of PV panels (18% of the total area).

Table 6 | Risk rating applied to the likelihood of sinkholes occurring at the sites

Risk Characterisation	Ground movement events anticipated per ha in a 20 year period (statistics based on inappropriate and poor service design and maintenance)
LOW	0 ≤ 0,1 events per ha anticipated but occurrence of events cannot be totally excluded
MEDIUM	Between 0,1 and 1,0 events per ha
HIGH	1,0 event or more anticipated per ha

Figure 6 | Existing sinkhole at point 4 on Site 2 as shown in Figure 7

Site 3 is largely situated on shale and quartzite of the Pretoria Group as indicated in Figure 7. Therefore there is a low risk of subsidence on this site.

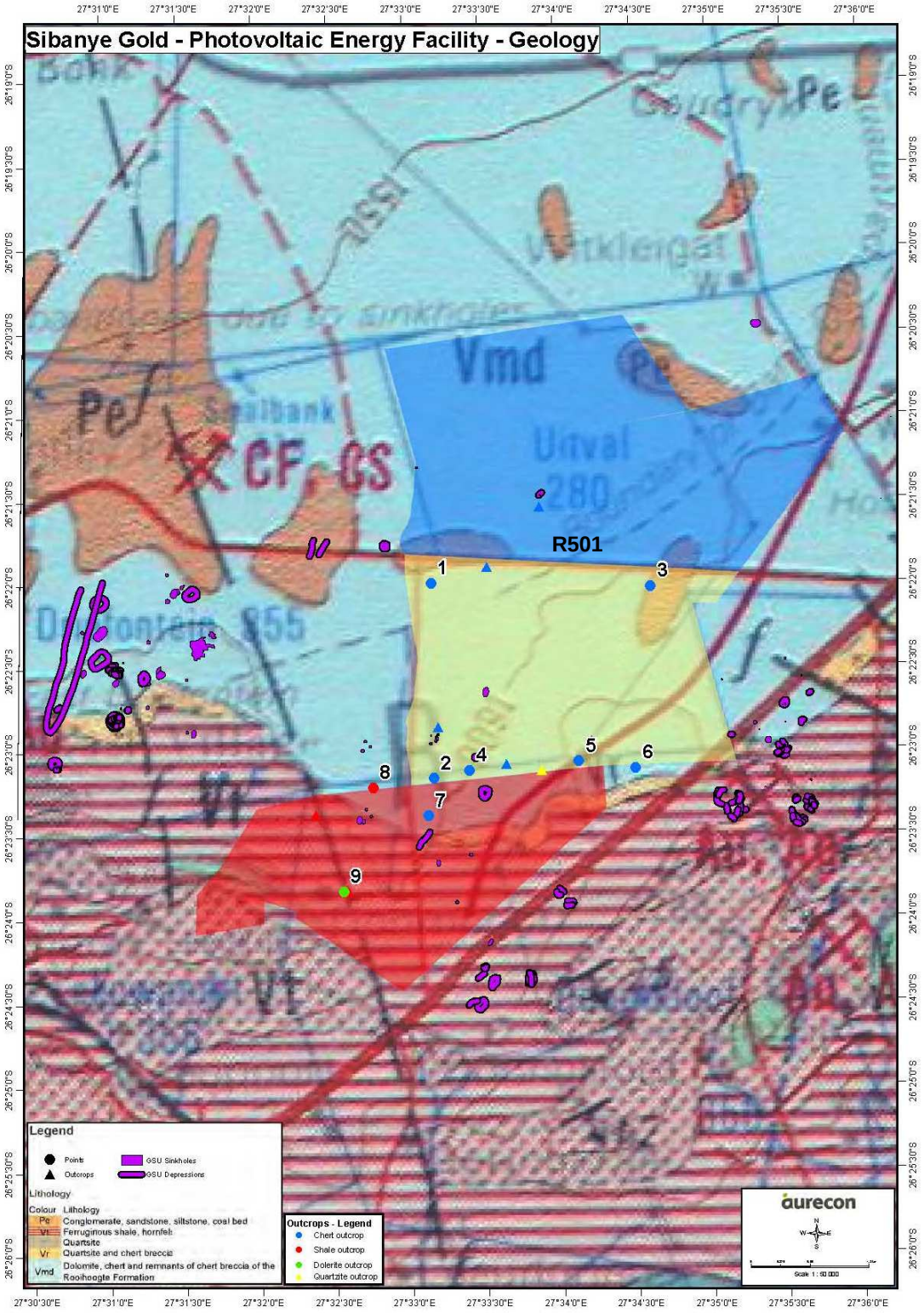


Figure 7 | Geology underlying the three sites (1:250,000 scale geological map, sheet 2626 West Rand)

Site 3 is strongly preferred (11%) above Site 1 (8%) and Site 2 (5%) out of 13.2%.

5.3.2 T2 Proximity to existing grid infrastructure and the ease of integration

The proposed PV facility would connect to the existing East Drie Gold or Libanon Distribution Substations in order to evacuate the power generated from the PV facility. The Midas Substation has been excluded as an option because it is a transmission substation and not a distribution substation. Where possible, the PV facility will tie into the existing Eskom infrastructure. However, on-site infrastructure will also be required.

Figure 8 | Libanon Distribution substation located to the north of the R501, adjacent to Site 1 and opposite Site 2

This sub-criterion investigated the ease of establishing grid connection to an existing substation to reduce the extent of additional associated infrastructure for the evacuation and transmission of the electricity. The cost of the overhead 132 kilovolt (kV) line was not considered in this sub-criterion as the technical ease of integration would indirectly account for the financial implications to construct the line. The consideration of proximity to existing substations and transmission lines (T2) accounted for 6.6% of the overall 33% technical criteria.

5.3.2.1 Assumptions

The evaluation of this criterion was influenced by the following assumptions:

- The further the PV facility is from the respective substations, the longer and hence more expensive the new overhead transmission lines would be;
- The new PV facilities could either tie into existing overhead distribution lines or directly to one of the distribution substations;
- Eskom will allow the new PV facility to tie into existing substations and or overhead distribution lines; and
- Lines that cross roads require more effort to obtain the relevant approvals and permits than lines that do not cross the main roads.

5.3.2.2 Discussions

All three sites could tie into either the East Drie Gold or the Libanon substation. Site 1 is located adjacent to the Libanon substation and is on the same side of the road as the substation. There are also two 44 kV parallel distribution lines traversing Site 1.

Site 2 is located on the opposite side of the R501 and to the south west of the Libanon substation. It is located approximately 3.7 km east of the East Drie Gold substation. Site 2 contains three 132 kV parallel distribution lines.

Figure 9 | Three 132 kV parallel distribution lines traversing Site 2 (view to the south with the R501 in the foreground)

Site 3 is located approximately 2 km south east of the East Drie Gold substation. Site 3 has four 132 kV distribution lines and two 400 kV transmission lines crossing the site.

Figure 10 | Three of the four parallel 132 kV distribution lines traversing Site 3 (view to the south east with the ridge in the distance to the right)

All sites are equally preferred (5%) at this stage of the project because the exact connection point has not yet been determined and because there are multiple connection options to tie into the existing substations or transmission lines for these alternatives.

5.3.3 T3 Continuity of the sites

As discussed in Section 3, the PV facility will have a total capacity of 200 MW. Although the facility will be developed in a phased approach, it is preferred that a single continuous site should be able to accommodate the total capacity of 200 MW. Sensitive features requiring buffers and existing infrastructure such as roads and existing transmission lines with specific servitudes can all result in the fragmentation of the sites. To construct a 200 MW PV facility, an area of 600 ha or more is required, excluding any sensitive features and servitudes on the identified sites;

The continuity of the sites were considered (T3) and this sub-criterion accounted for 6.6% of the overall technical criteria of 33%.

5.3.3.1 Assumptions

The evaluation of this sub-criterion was influenced by the following assumptions:

- Sites with sensitive features and servitudes along the edges were preferred over sites with servitudes and sensitive features that bisect the sites into large portions;
- Areas that were too steep must be excluded from the development area (i.e. ridgelines); and
- An intact square or rectangular shaped site is preferred over a number of small separated sites with irregular shapes (e.g. triangles or parallelograms).

5.3.3.2 Discussions

The following features were identified on Site 1 contributing to fragmentation (refer to Figure 2)**:**

- Two sets of transmission lines each with a total servitude of 50 m on each outer transmission line located predominantly at the edges to the north and east;
- One of the planned Gautrans Pretoria-Witwatersrand-Vereeniging (PWV) roads bisects the western portion of the site and requires an assumed total servitude of 48 m (this was not confirmed with Gautrans but is an estimate based on guidelines and experience); and
- A small area mapped as a CBA in the south western corner of the site should be excluded from the available development area;
- A drainage line / erosion gulley, which traverses the site from south east to north west.

These features, with the exception of the drainage line, were mapped as negative for development. The reason why the drainage line has not been mapped as negative for development is that a floodline determination had not yet been completed at the time of the site selection process, so it is unclear how much land would need to be relinquished around this feature. The area remaining and suitable for development is approximately 790.96 ha out of a total area of 851.13 ha (i.e. 92.93 % of the site remains available for development). This remaining available area of the site is divided into five portions, of which the largest undivided portion is 605.80 ha.

The following features that contribute to fragmentation were identified on Site 2 (refer to Figure 2):

- Site 2 borders a wetland to the west, requiring a buffer of 50 m. The delineation of the boundaries of this wetland was undertaken by Digby Wells;
- Three 132 kV transmission lines requiring a total buffer of 50 m from each outer transmission line;
- An existing gravel road that links from the N12 to the R501, as well as an area for the planned PWV road, which requires an assumed servitude of 48 m; and
- A CBA associated with the untransformed ridge dominates the south eastern extent of the site, should be excluded from the available development area.

The area of Site 2 remaining and suitable for development is approximately 430.88 ha out of a total area of 775.04 ha (i.e. 55.60 % of the site remains available for development). The remaining available development area of the site is divided into five portions, of which the largest remaining intact portion is approximately 318.58 ha in extent.

The following features that contribute to fragmentation were identified on Site 3 (refer to Figure 2):

- The wetland bisecting the site requires a buffer of 50 m. The delineation of the boundaries of this wetland was undertaken by Digby Wells;
- An existing gravel road bisects the site roughly in two equal halves and requires an assumed servitude of 48 m;
- Four 132 kV transmission lines as and two 400 kV transmission lines bisect the site in three distinct portions and require a buffer of 50 m adjacent to each outer transmission line;
- Heritage resources such as a cemetery and a historic homestead located on Site 3 are “No-Go” Areas; and
- A CBA associated with the untransformed ridge dominates the south western and eastern extents of the site and should be excluded from the available development area.

The area of Site 3 remaining suitable for development is approximately 272.47 ha out of a total area of 622.96 ha (i.e. 43.74 % of the site remains available for development). This remaining available area of the site is divided into eight portions, of which the largest undivided portion is 94.96 ha in extent.

Based on the areas remaining, Site 1 (5%) and thereafter Site 2 (4%) are strongly preferred over Site 3 (1%) as Site 3 is fragmented into small fragments and only 44% of Site 3 remains suitable for development, compared to 93% of Site 1 and 56% of Site 2 (Figure 2). A combination of sites 1 and 2 may need to be developed to meet the requirements of at least 600 ha of available land in order to develop the full 200 MW capacity. Although Sites 1 and 2 are separated by the R501, development of these two sites in combination would be feasible since the sites are directly opposite each other. Furthermore, development of these sites could occur in a phased approach, as is anticipated for the project.

5.3.4 T4 Ease of establishing access to the site

Numerous truckloads would need to access the site during the construction phase and could affect existing traffic. Limited vehicle movement are expected for the operational phase. There are existing off-site and on-site roads associated with all three sites, as indicated in Figure 11, which could be used to access the sites during construction and operation. The upgrade of internal access roads and potential construction of new road sections would be required in order to join the on-site construction yard/ office buildings with the off-site roads.

Existing road (R501) to access the gravel road to Site 1, looking north. This is directly opposite the intersection of the R501 and the gravel road to Driefontein.

Existing road to access Site 2 (gravel road off the R501 which joins to the N12) looking south. Site 2 is in the left of the image. This road would also be used to access Site 3, which is further along this road.

Figure 11 | Existing off-site access roads to the three site

Although the sites can easily be accessed, the point of access should be carefully selected to avoid right turning vehicles and trucks from causing impacts on the traffic flow. This will be addressed in the EIA process and was not considered in detail in this site selection process.

The ease of accessing the site sub-criterion (T4) accounted for 4.95% of the total 33% technical criteria.

5.3.4.1 Assumptions

The evaluation of this sub-criterion was influenced by the following assumptions:

- It would be less expensive to upgrade an existing road than to construct new access roads;
- Shorter routes would be less expensive to build than longer routes;
- It was assumed that the proposed PWV roads would not be constructed and operational in time to be used by the PV facility; and
- Any potential upgrades to the off-site roads were excluded from the rating process.

5.3.4.2 Discussions

There was an equally strong preference for all three sites (4%) based on the ease of direct access to the site from the R501 and the gravel road directly off the R501, which links the R501 to the N12 and leads to the Driefontein.

Sites 1, 2 and 3 can be accessed via gravel roads at the intersection and opposite the intersection of the R501 and the road to Driefontein. Site 3 can be also be accessed via the Driefontein road off the N12.

5.3.5 T6 Potential solar radiation

As indicated in Figure 12, Johannesburg and Soweto received between 1975 and 2050 kilowatt/ hour/ m^2 radiation from 1994 to 2013. The proposed sites are located 30 km south west of Soweto.

Sub-criterion T6 accounted for a relatively small percentage (1.65%) of the total 33% technical criteria as T6 would be similar across all three sites, based on the close proximity to one another.

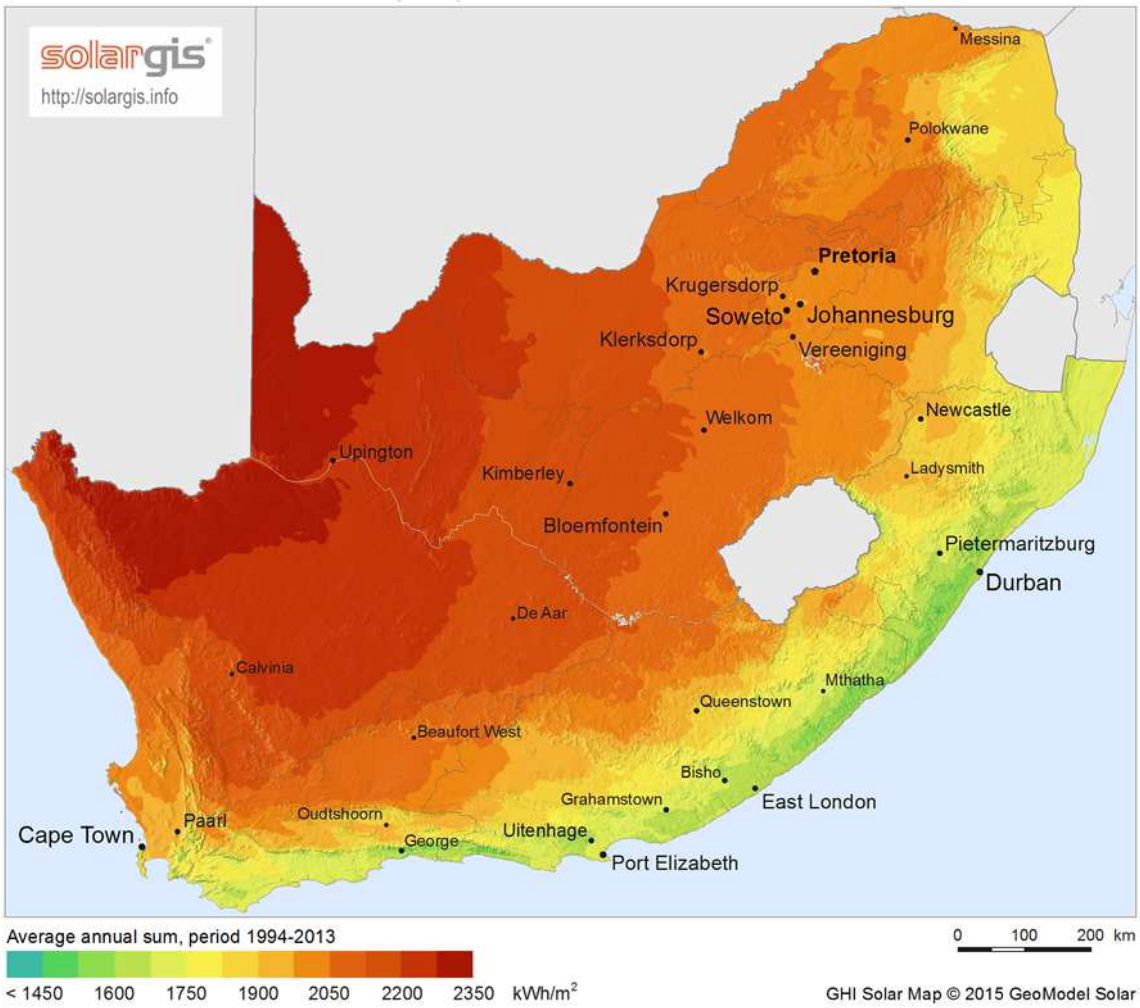


Figure 12 | Global horizontal irradiation for South Africa (source: http://solargis.info/doc/free-solar-radiation-maps-GHI, accessed on 8 September 2015)

5.3.5.1 Assumptions

The evaluation of this criterion was influenced by the following assumptions:

- The lack of detailed terrain maps or survey data would not result in a biased outcome of the MCDM process and that visual observations made at each site and supported by aerial imagery are sufficient.

5.3.5.2 Discussions

There was an equally strong preference for all three sites (4%) based on amount of solar radiation the Soweto / Johannesburg area receives per annum.

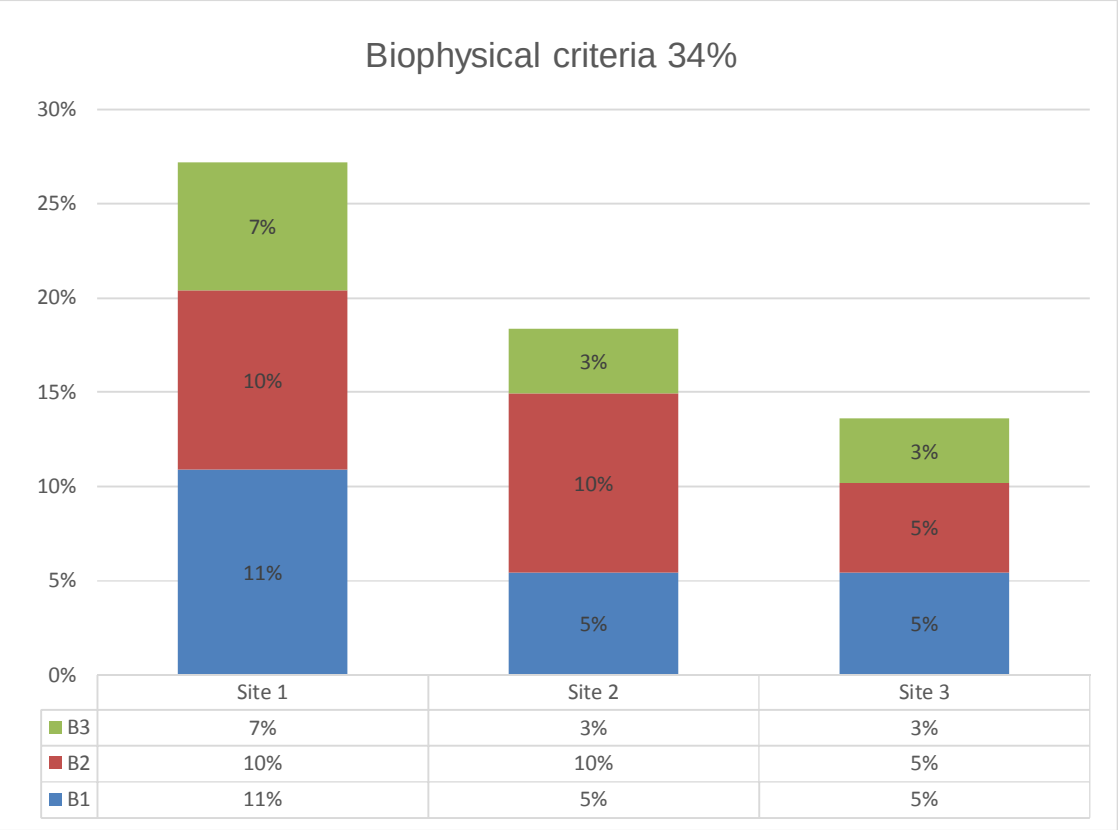
6 RESULTS OF THE MCDM PROCESS

Using the methodology for site selection described in Section 4.1, each criterion was evaluated separately by the relevant project team member as discussed in Section 4.2 and indicated in Table 3. The summary of results in this section has been structured to indicate how sites measured against one another when only considering technical, biophysical or social criteria and then concludes with the outcome that considers all three criteria.

6.1 Outcome when considering only biophysical criteria

When considering the biophysical criteria only, Site 1 (27%) is preferred above Site 2 (18%), which is preferred above Site 3 (14%) as indicated in Figure 13.

Site 1 was distinctly preferred based on the lack of sensitive ecological features on the site. Site 2 is preferred above Site 3 solely based on the presence of a large wetland that bisects Site 3, whilst there is no wetland on Site 2.



	Site 1	Site 2	Site 3
B3	7%	3%	3%
B2	10%	10%	5%
B1	11%	5%	5%

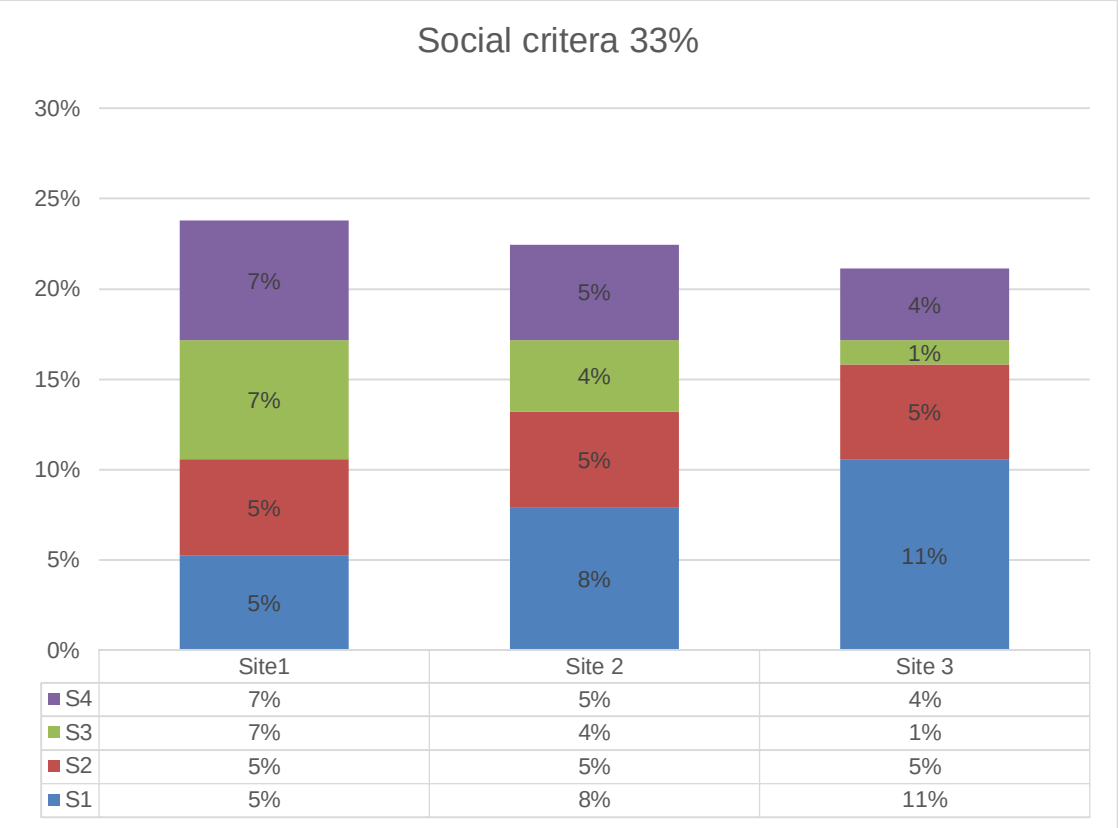
Figure 13 | Preference of alternatives based on combined biophysical criteria

6.2 Outcome when considering only social criteria

When considering the social criteria only, Site 1 (24%) is preferred above Site 2 (22%), which is preferred above Site 3 (21%) as indicated in Figure 14. All sub-criteria were differentiating sub-criteria except for S2 (land use), which was rated equal across the three sites.

In terms of S1 (agricultural use), Site 3 was most preferred based on the least agricultural potential loss at the site. However this was negated by criterion S3 (heritage), based on the heritage resources at Site 3.

Site 1 is most preferred in terms of S3 (heritage) since the site is completely disturbed by maize production and is therefore not likely to contain heritage resources. The site is also most preferred in terms of S4 (visual impacts) since the site is flat and is not located adjacent to a national road and surrounding communities as is the case with sites 2 and 3.



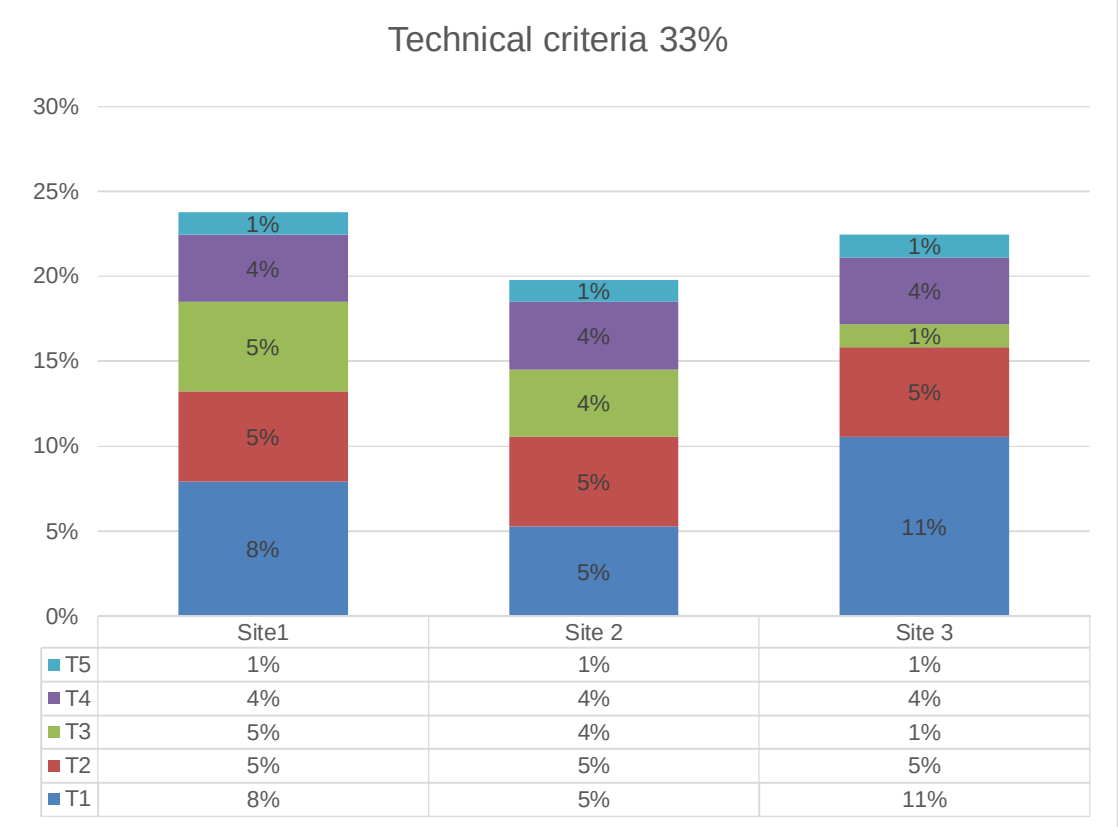
	Site1	Site 2	Site 3
S4	7%	5%	4%
S3	7%	4%	1%
S2	5%	5%	5%
S1	5%	8%	11%

Figure 14 | Preference based on combined socio-economic criteria

6.3 Outcome when considering only technical criteria

When considering the technical criteria only, Site 1 (24%) is preferred above Site 3 (22%), which are both preferred above Site 2 (20%) as indicated in Figure 15. T1 (geotechnical stability) and T3 (continuity of available area) were the differentiating sub-criteria as T2, T4 and T5 (ease of grid connection, road access and solar radiation respectively) were rated equally across the three sites.

In terms of T1 (geotechnical stability), Site 2 was least preferred based on it having the highest potential for geological instability. Site 3 was most preferred in terms of T1 but this was neutralised by T3 (continuity of the available area) as Site 3 is highly fragmented by the existing servitudes, roads and sensitive features on the site.



	Site1	Site 2	Site 3
T5	1%	1%	1%
T4	4%	4%	4%
T3	5%	4%	1%
T2	5%	5%	5%
T1	8%	5%	11%

Figure 15 | Preference of alternatives based on combined technical criteria

6.4 Combined outcome

When combining all of the criteria, there is a clear preference for Site 1 (77.10%) over Site 2 (60.60%) and Site 3 (57.16%) as indicated in Figure 16 below. This follows the trend for all three criteria except for the technical criterion for all the three sites. Although Site 3 is technically preferred to Site 2, Site 2 is preferred overall based on a stronger score for biophysical and social criteria than Site 3.

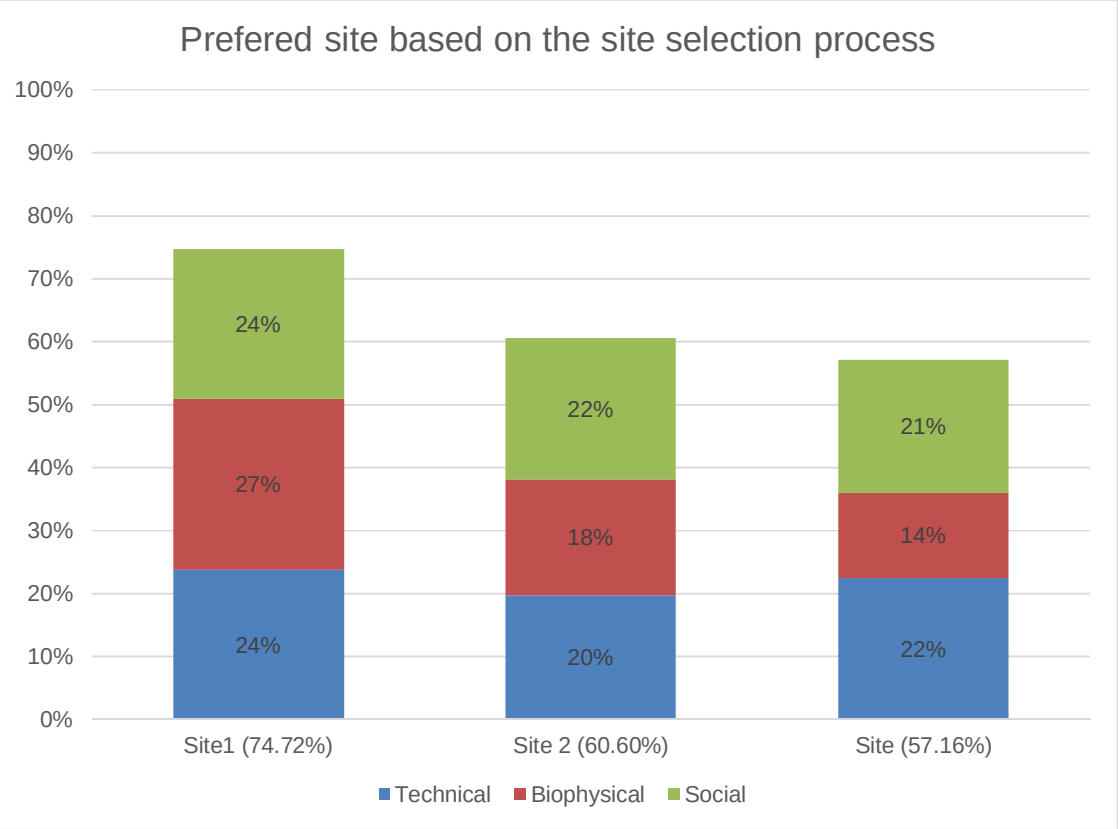


Figure 16 | Overall preference of the sites

7 SENSITIVITY ANALYSIS

The base case (with a weighting of technical 33%, biophysical 34% and social 33%) indicated an overall preference for Site 1 as indicated in Section 6.4. To test whether the base case is robust, a sensitivity analysis was done by plotting the relative preference, i.e. changing the weighting of technical, biophysical and social criteria, in alternative scenarios. The weightings of sub-criteria were adjusted pro-rata.

To test the robustness of the base case, four sensitivity analyses were done by changing the overall weighting of the three main criteria categories as follows:

- Scenario 1 (Technical 50%, Biophysical 25% and Socio-economic 25%).
- Scenario 2 (Technical 80%, Biophysical 10% and Socio-economic 10%).
- Scenario 3 (Technical 0%, Biophysical 50% and Socio-economic 50%).
- Scenario 4 (Technical 50%, Biophysical 25% and Socio-economic 25%, but excluding all the criteria that are rated equally).

As indicated in the figures below, the base case outcome was plotted against the outcome of each of the sensitivity analyses for ease of comparison. In all cases the overall preferred site remained the same, as well as the sequence of the second and third ranked sites. The preferred site remained Site 1 throughout as indicated in Figure 17 to Figure 20.

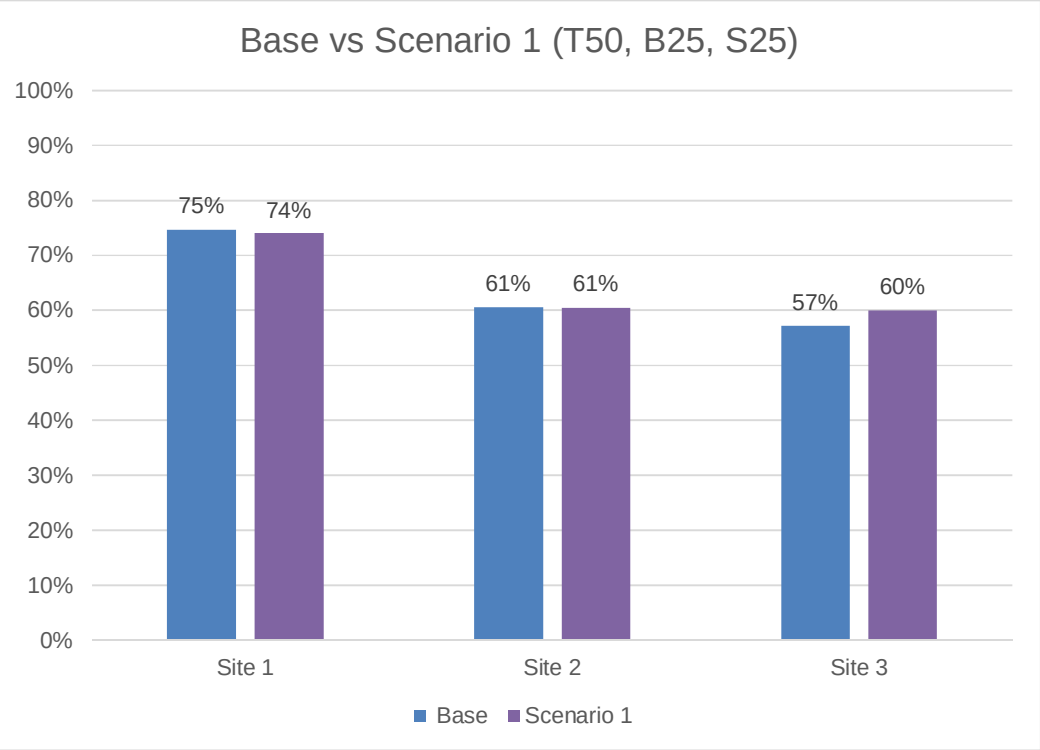


Figure 17 | Outcome of sensitivity analysis scenario 1

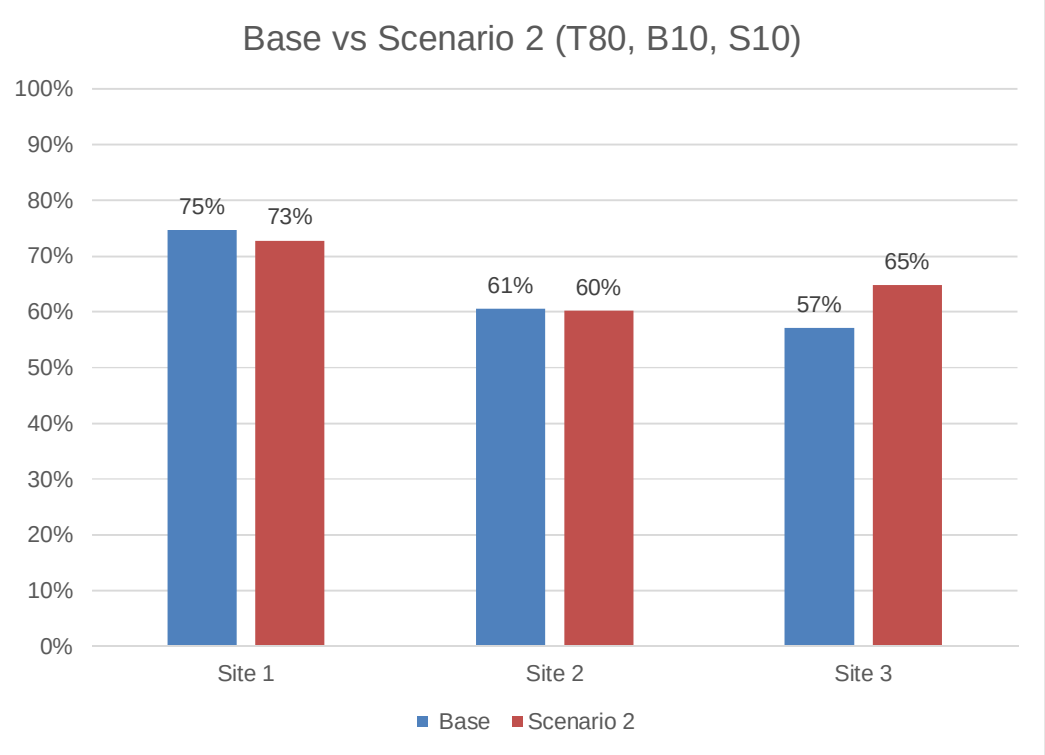


Figure 18 | Outcome of sensitivity analysis scenario 2

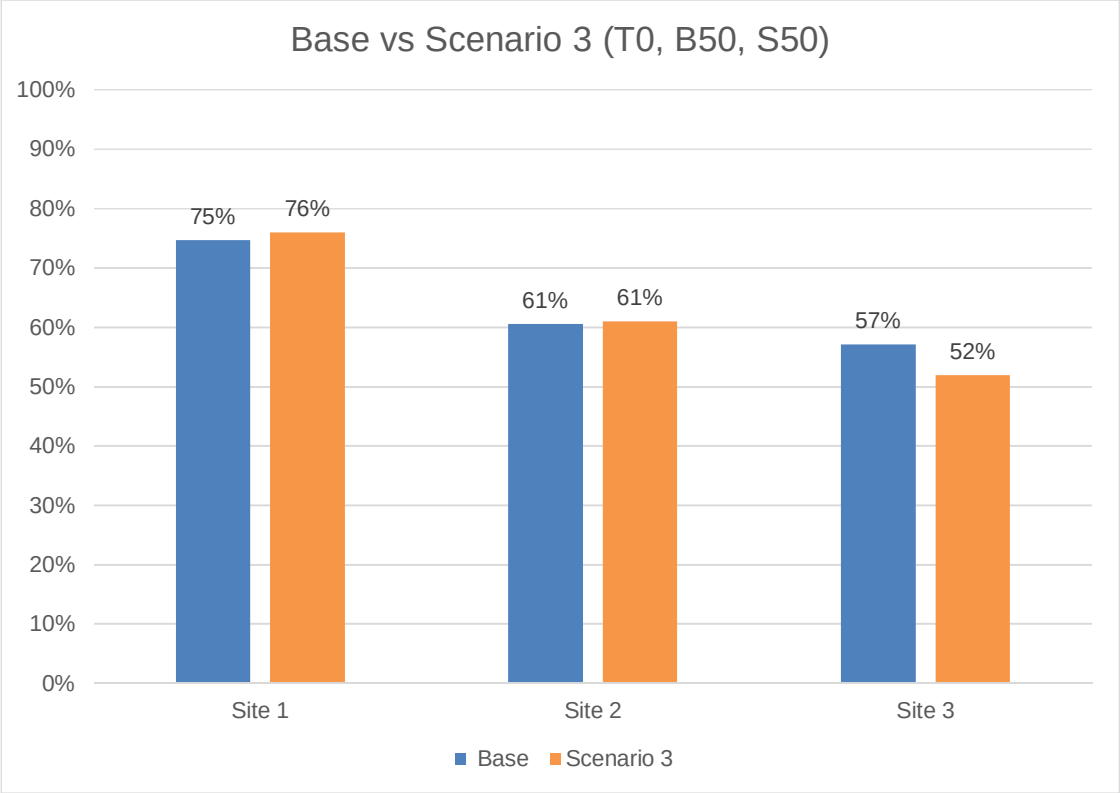


Figure 19 | Outcome of sensitivity analysis scenario 3

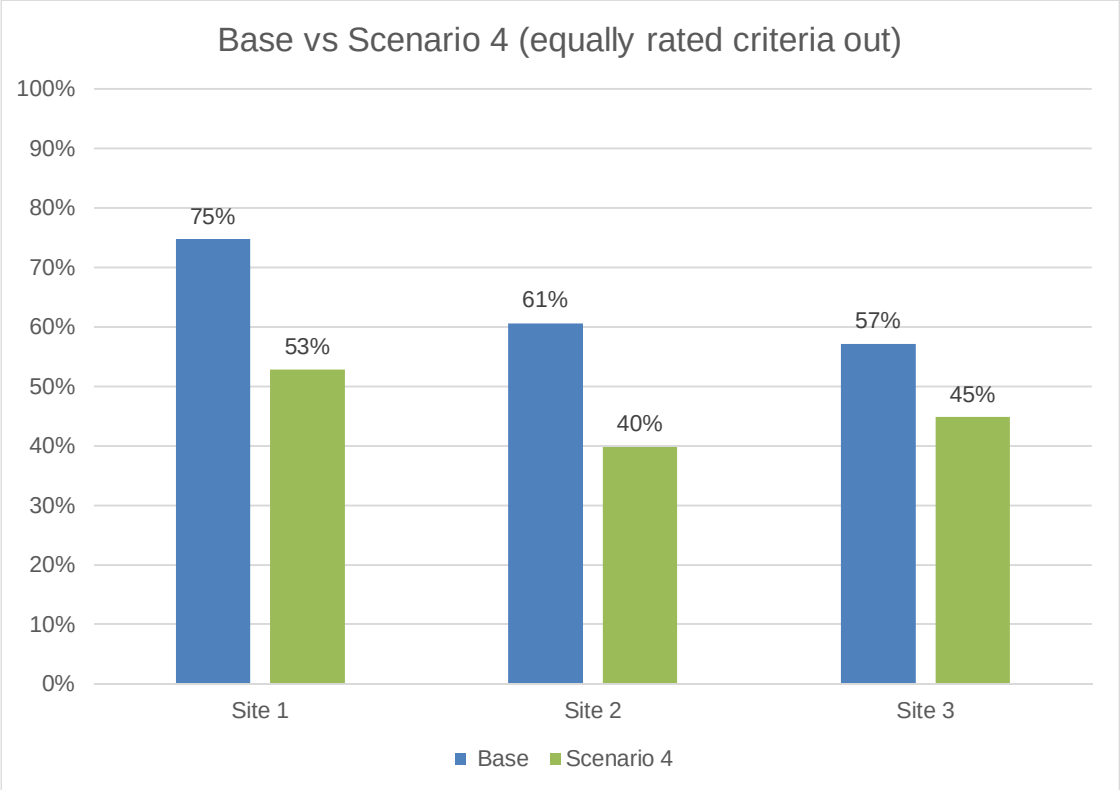


Figure 20 | Outcome of sensitivity analysis scenario 4

This sensitivity analysis confirmed Site 1 as the preferred site in all four instances. Scenarios 1 and 3 indicated that Site 2 is preferred over Site 3 and Scenarios 2 and 4 indicated that Site 3 is preferred over Site 2.

8 CONCLUSION

The MCDM process assisted in identifying the limitations and advantages of each site from a biophysical, social and technical point of view. It also assisted in identifying an overall preferred site for which resources and effort should be spent in terms of further detailed assessments. Table 7 provides a summary of the prominent advantages and limitations of each site.

Table 7 | Summary of limitations and advantages of each site

Site	Limiting factors	Advantages
Site 1	• The site is dominated by high agricultural potential soils, which will be lost with the development of the PV facility. • The site is located on dolomite, which is susceptible to sinkholes and subsidence but less so than Site 2. • The site has a drainage line, which originates next to the R501 and extends to the north-western boundary of the site. The impact of this feature on the area available for the PV plant will be unclear until a floodline determination has been done.	• The site is flat. • The site is outside of the Gauteng agricultural hubs. • A large fairly rectangular area remains after the sensitive features, servitudes and buffers have been considered. • The site is located adjacent to the Libanon substation. • Lack of sensitive features (natural or heritage) on the site. • Minimal fragmentation of the site by transmission lines.

Site	Limiting factors	Advantages
Site 2	• The northern and western portions of the site have high agricultural potential soils. • The south eastern portion of the site is dominated by a ridge, which is mapped as a CBA and is an important habitat for fauna and flora. • The site borders wetlands on its western and eastern boundaries. • The site is located on dolomite, which is susceptible to sinkholes and subsidence.	• The site is outside of the Gauteng agricultural hubs. • Minimal fragmentation of the site by transmission lines. • The northern and western region of the site is flat. • The site is located in close proximity to the Libanon and East Drie substations.
Site 3	• The site is bisected by a wetland and transmissions lines. • Heritage resources such as a farmstead and cemetery are located in the south western and northern extents of the site. • The site is highly fragmented by servitudes, buffers, roads, and sensitive features. • The south western and eastern extent of the site is dominated by a ridge, which is mapped as a CBA and is an important habitat for fauna and flora.	• The site is outside of the Gauteng agricultural hubs. • The site is underlain by shale and quartzite of the Pretoria Group, which are not at risk of sinkholes or subsidence. • Low agricultural potential soils. • The site is located in close proximity to the East Drie Gold substation.

Due to the preferred rating of Site 1 followed by Site 2 based on an integrated analysis of technical, biophysical and socio-economic criteria, it is recommended that both Site 1 and Site 2 be assessed in the EIA study. Although, the recommendation can be that only Site 1 be considered, it is recommended that Site 2 be included as well, based on the size requirements and the constructible areas that remain (see Table 8). In addition, Figure 21 indicates the remaining available areas, considering all the sensitive features, servitudes and sensitive area buffers.

Table 8 | Extent of sites and remaining constructible areas

Site	Extent (pre site selection process) (ha)	Remaining constructible areas (ha)
1	851.13	790.96
2	775.0.4	430.88
3	622.96	272.47

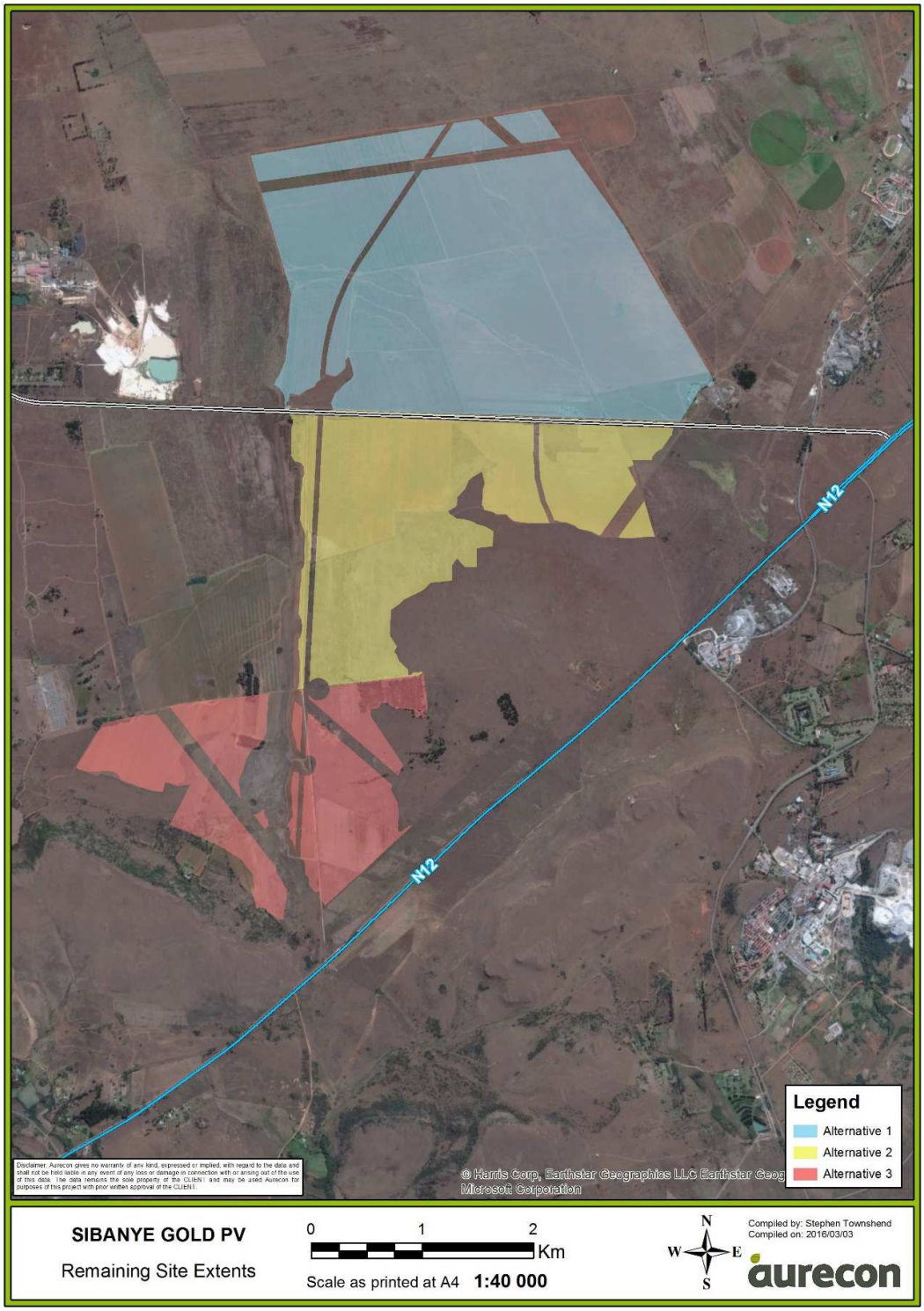


Figure 21 | Remaining available site area taking into account the services, infrastructure, sensitive features and buffers for the three sites (excluding the effect of the drainage line on Site 1)

It can be concluded that the application of the selected MCDM model has yielded reliable results, given the wide focus of the different criteria and the consistency of the outcomes throughout the application of the model and the sensitivity analysis. As such, exclusion of Site 3 for further, more detailed analysis in the assessment phase of the project can be based on these results with a high degree of confidence.

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