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DRAFT BASIC ASSESSMENT REPORT

Proposed Construction of a <20MW Solar PV on Melkboskuil, Farm 132/26, Carolusberg.

THE CLIENT

NK Energie (Pty) Ltd.

DATE

Feb 2014

environmental affairs
Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

(For official use only)

File Reference Number:	
Application Number:	
Date Received:	

Basic assessment report in terms of the Environmental Impact Assessment Regulations, 2010, promulgated in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended.

Kindly note that:

1. This basic assessment report is a standard report that may be required by a competent authority in terms of the EIA Regulations, 2010 and is meant to streamline applications. Please make sure that it is the report used by the particular competent authority for the activity that is being applied for.
2. This report format is current as of 1 September 2012. It is the responsibility of the applicant to ascertain whether subsequent versions of the form have been published or produced by the competent authority
3. The report must be typed within the spaces provided in the form. The size of the spaces provided is not necessarily indicative of the amount of information to be provided. The report is in the form of a table that can extend itself as each space is filled with typing.
4. Where applicable tick the boxes that are applicable in the report.
5. An incomplete report may be returned to the applicant for revision.
6. The use of "not applicable" in the report must be done with circumspection because if it is used in respect of material information that is required by the competent authority for assessing the application, it may result in the rejection of the application as provided for in the regulations.
7. This report must be handed in at offices of the relevant competent authority as determined by each authority.
8. No faxed or e-mailed reports will be accepted.
9. The signature of the EAP on the report must be an original signature.
10. The report must be compiled by an independent environmental assessment practitioner.
11. Unless protected by law, all information in the report will become public information on receipt by the competent authority. Any interested and affected party should be provided with the information contained in this report on request, during any stage of the application process.
12. A competent authority may require that for specified types of activities in defined situations only parts of this report need to be completed.
13. Should a specialist report or report on a specialised process be submitted at any stage for any part of this application, the terms of reference for such report must also be submitted.

14. Two (2) colour hard copies and one (1) electronic copy of the report must be submitted to the competent authority.
15. Shape files (.shp) for maps must be included on the electronic copy of the report submitted to the competent authority.

SECTION A: ACTIVITY INFORMATION

Has a specialist been consulted to assist with the completion of this section? YES√ NO

If YES, please complete the form entitled "Details of specialist and declaration of interest" for the specialist appointed and attach in Appendix I.

1. PROJECT DESCRIPTION

a) Describe the project associated with the listed activities applied for

The proposed PV Solar facility will be located close to the town of Carolusberg in the Nama Khoi Municipality in the Northern Cape Province. The proposed facility will be constructed on Melkboskuil, Farm 132/26 (SG 21 Digit Code: C05300000000013200026). The proposed site may be reached either by travelling from the centre of the town of Springbok, eastward on Voortrekker Street which later becomes the N14 as it exits the town to the east. Travel on the N14 for 5.7 km to the Carolusberg turn-off, here turn left and travel 1.3 km east passing Carolusberg to the south. At this point there is a gravel road which turns left and northwards, follow this road for 1.3 km, access to the property may be gained via a farm track to a gate on the left, see also Appendix A1 – Locality Map.

The proposed site for the construction of the PV Solar Array together with associated infrastructure and lay down areas has been identified to accommodate a facility with the following specifications:

A <20MW Solar Array – this is not a tracking system, therefore a static PV solar array fixed to factory supplied fittings and roves or metal structures anchored firmly to the ground. The anchorage points will be constructed of steel anchored to a concrete pad. The PV panels will be attached at a suitable angle to maximise solar yield in rows 4 meters wide and 4 metres high. The bottom of the solar panel will be approximately 1m above ground level. The orientation of the array will be such that it will have optimal exposure to the sun as it tracks east to west. Electric cabling on the array itself will be housed in a tray mounted directly beneath each of the rows, see Appendix A3 – Site Plan. In turn this cabling will link to underground cabling, connected to the transformer and from there directly to the grid via a 66kV/132kV power line to the substation located approximately 580m directly south of the corner of the western and southern boundary of Melkboskuil, Farm 132/26, see also Appendix A3 – Site Plan. The routing for the connection will run along the western boundary of the property southwards and then in a south easterly direction along a road that runs to the open cast mine south of the property and on to the substation as indicated in Appendix A3 – Site Plan. The inverters will convert the direct electrical current generated by the PV Array to the equivalent Alternating Current kV of the connecting line and from there feed electricity from the array to the substation via the power line. The exact positioning of the components of the PV array will be guided by the final site development plan and will be dependent on site specific conditions evident from the detailed survey of the site.

Internal access roads will be required to service the proposed development and the power line. However existing roads are sufficient to gain access to the site to service the proposed development and transport all equipment and material to the site during the construction phase. These roads may however need to be upgraded to allow for access of construction vehicles and machinery.

For security purposes a galvanised razor wire topped fence will be erected around the proposed array. Access to the site will be through a padlocked gate. As this site is located near to a rural town it will require on site security to ensure that theft and / or vandalism of the solar facility does not occur,

thus on-site security and access control rooms. Additionally storage sheds will be erected for maintenance and storage purposes.

Site surveys, road servitudes and geotechnical surveys may be required prior to the construction phase. Access to the site from the N14 and the will not require any an upgrade of the road infrastructure. Access within the site will require the construction of access tracks to transport array components to the site of construction and once operational for maintenance and repair purposes. The final layout of these internal access roads can only be determined once the project is viable and specific site scale information has been generated through the applicable surveys. The proposed site layout represents the layout that responds most adequately to the site sensitivities identified in this assessment and with the assistance of the specialists used in the assessment.

The sites chosen are level to gently undulating however construction activities would include localised levelling and clearing of the site, trenching for the underground cabling and the digging of foundations at the anchorage points. The storage sheds and fencing would be constructed once the arrays are in place. The site would also need a temporary construction camp to have an area to store and lay out the building materials and components. The site would need to be regularly maintained and the panels themselves cleaned twice a year at least. The arrays will require water for cleaning to remove accumulated dust etc. The volume of water required to clean the array amounts to approx. 1200 litres per MW twice annually thus for a <20MW facility it would amount to 48 m^3. The water to service and maintain the array will be sourced from the local municipality.

The next stage in the activity would entail the preparation of the site itself which could include the clearance of vegetation at the anchorage points. Vegetative cover between anchorage points and between array rows will be kept intact as far as practicably possible. Topsoil will be stripped when clearing the site of vegetation, stockpiled separately and back filled and spread around the anchorage structure on completion this process will be completed during the construction of the array with each anchorage area being backfilled and levelled directly after completion. Vegetation within and adjacent to the array would need to be brush cut on an annual basis.

The transport of components to the site is possible through the national and provincial road system. During construction the site will have associated construction equipment associated with it including front end loaders, excavators for foundations and trenching, haulage trucks, graders, compaction equipments, cement truck etc. Components for the construction transported to the site will be laid down within the identified development footprint i.e. no separate lay down areas are being contemplated.

All areas that are not required for service and maintenance activities which may have been impacted by the construction phase will be closed and rehabilitated as soon as construction activities have been completed. Details for the rehabilitation are contained in the Environmental management Programme.

The components of the array can be fully dismantled and removed in unlikely event that the site is fully decommissioned once the lifespan of the panels (estimated at 20 years) has been reached. A more likely scenario would be the replacement of the current panels in the array with a more efficient panel in future as the technological advances with increased panel efficiency capturing greater solar radiation. Technological advances are accelerating rapidly at the present time.

b) Provide a detailed description of the listed activities associated with the project as applied for

Potential Listed Activities – NEMA Regulation 544	Short description of the listed activity	Description of the listed activity.
1	A facility >10MW but less than 20MW A facility of <10MW should not exceed 1 ha in size.	Proposed development together with associated infrastructure will cover >1ha and be larger than 10MW.
11	Any construction within 32m of a watercourse, this includes temporary drainage lines, is regarded as a significant impact	The construction of the proposed sites may impact on a drainage line on the site. This could be from the solar array itself or from the road infrastructure required for the construction and maintenance of the site.
18	Any proposed access roads or service infrastructure crossing a watercourse and causing the removal of >5m^3 of sand, gravel or stone is considered a significant impact.	The construction of the proposed sites may impact on a drainage line on the site through requiring infilling or depositing or removal of material from a watercourse above this threshold. This could be from the solar array itself or from the road infrastructure required for the construction and maintenance of the site.
22	The construction of a road outside urban areas; (i) With a reserve wider than 13.5 metres	At present the site has small farm tracks, these may need to be upgraded to allow adequate access to the site.
23	The transformation of undeveloped, vacant or derelict land to – (ii) Residential, retail, commercial, recreational, industrial use outside an urban area and where the total area to be transformed is bigger than 1 ha but less than 20 ha's	The PV facility will involve the transformation from an agricultural landuse to an industrial landuse outside an urban area where the area transformed will be >1ha but <20ha's.
Potential Listed Activities – NEMA Regulation 546	Short description of the listed activity	Description of the listed activity.
10	The construction of facilities or infrastructure for the storage, or for the storage and handling, of a dangerous	The proposed areas for development of the solar facility on Carolusberg are within 5 km of the Goegap Nature Reserve.

	good, where such storage occurs in containers with a combined capacity of 80 but not exceeding 500 cubic metres. (ii) Outside Urban Areas in (gg) Areas within 10 km of national parks or world heritage sites or 5 km from any other protected area identified in terms of NEMPAA or from the core areas of a biosphere reserve;	
14	The clearance of 5 ha's or more of vegetation where 75% or more of the vegetation cover constitutes indigenous vegetation.	While every effort is being made to locate the solar facility on old disturbed or transformed land, this listed activity may be triggered due to the unavoidable need to transform areas of extant natural vegetation.

2. FEASIBLE AND REASONABLE ALTERNATIVES

"alternatives", in relation to a proposed activity, means different means of meeting the general purpose and requirements of the activity, which may include alternatives to—

(a) the property on which or location where it is proposed to undertake the activity;
(b) the type of activity to be undertaken;
(c) the design or layout of the activity;
(d) the technology to be used in the activity;
(e) the operational aspects of the activity; and
(f) the option of not implementing the activity.

Describe alternatives that are considered in this application as required by Regulation 22(2)(h) of GN R.543. Alternatives should include a consideration of all possible means by which the purpose and need of the proposed activity (NOT PROJECT) could be accomplished in the specific instance taking account of the interest of the applicant in the activity. The no-go alternative must in all cases be included in the assessment phase as the baseline against which the impacts of the other alternatives are assessed.

The determination of whether site or activity (including different processes, etc.) or both is appropriate needs to be informed by the specific circumstances of the activity and its environment. After receipt of this report the, competent authority may also request the applicant to assess additional alternatives that could possibly accomplish the purpose and need of the proposed activity if it is clear that realistic alternatives have not been considered to a reasonable extent.

The identification of alternatives should be in line with the Integrated Environmental Assessment Guideline Series 11, published by the DEA in 2004. Should the alternatives include different locations and lay-outs, the co-ordinates of the different alternatives must be provided. The co-ordinates should

be in degrees, minutes and seconds. The projection that must be used in all cases is the WGS84 spheroid in a national or local projection.

a) Site alternatives

Alternative S1 (preferred alternative)		
Description	Lat (DDMMSS)	Long (DDMMSS)
Assessment of site alternatives in this instance is not possible as this is the only site available that meets with the criteria for selection. The site which has been selected for the assessment of potential impacts was identified based on the following criteria: (1) Available solar resource linked to site characteristic such as topography and climatic conditions – the site chosen has the highest solar irradiation values and at temperatures that are suitable for PV Solar power generation, (2) Adjacency to existing electricity grid infrastructure i.e. an existing substation – there is an existing sub-station ~800m due south of the site which has the capacity to accept the power generated from this proposed facility. An alternative connection to a substation to the north of the site is possible but has not been considered as it is significantly longer and would definitely have greater environmental impact and would be significantly more expensive to construct, (3) Capacity within the sub-station to accommodate additional power generation, (4) Road access to the site from the national and provincial road network and within the site, (5) Topography of the site and underlying geology, (6) Adjacency and potential impact on sensitive ecosystems, (7) Adjacency and potential impact on sensitive habitats and species, (8) Economic viability of the site based on the baseline sensitivities identified and the spatial area available which is suitable, (9) Potential Impact on cultural/ historical heritage and visual receptors in the surrounding landscape.	29º 37' 43.203'' S	17 º 57' 50.617'' E
Alternative S2		
Description	Lat (DDMMSS)	Long (DDMMSS)

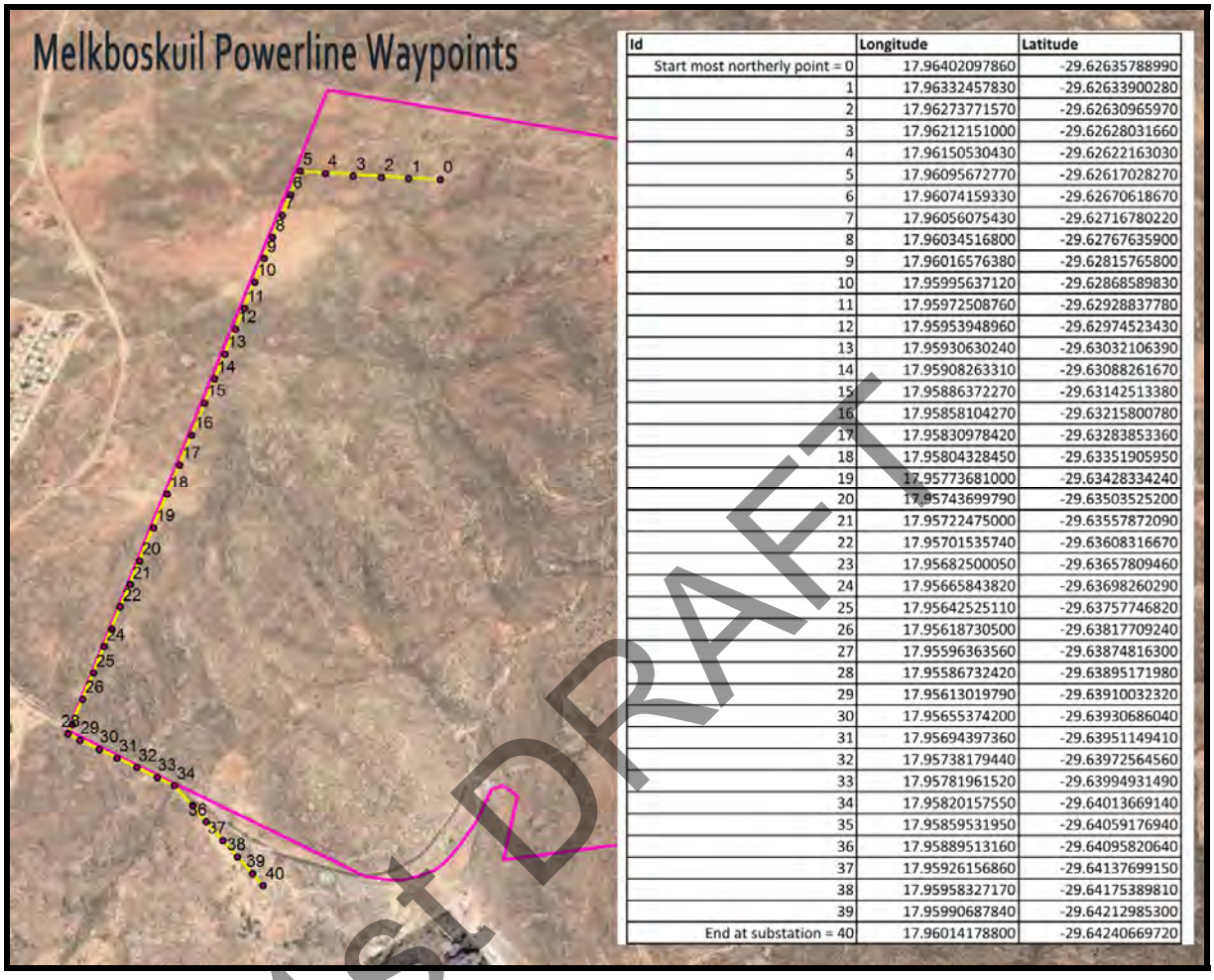
NOT APPLICABLE – As above a site alternative is not available in this instance.	N/A	N/A
Alternative S3 – (No go Alternative)		
Description	Lat (DDMMSS)	Long (DDMMSS)
No Go Alternative - To pursue the no go option is not considered feasible. From an economic perspective this landuse option is aligned with international, national, provincial, local and fine scale forward planning - the intensive use of land for the generation of renewable energy does translate into the most economically sustainable landuse for this marginal agricultural locality. The opportunity cost weighs in favour of the proposed development due to the suitability of the site for the proposed development from a heritage and visual impact perspective, conservation status of the ecosystem type, low potential impact of the development where approx. 6.5% of the land surface of the property can supply enough additional income to make the development economically viable for the landowner. Furthermore the transformation of <20 ha's of primarily transformed and/or degraded habitat will not impair the quality of biodiversity pattern or process assets on the site. The area is economically active due to its suitability for the extensive grazing of small stock, however returns from this landuse are marginal at best in these arid ecosystems. Sustainable landuse options for people in this location are therefore very limited and in our consultation appear to be closely linked to the ability of a landowner to diversify the income streams into the property to attain a position where the property becomes a viable business.. Fundamentally it appears that it would be at odds with international commitments in terms of the use of renewable energy, the forward planning of National Government, the PSDF and DF, IDP. For these reasons the no-go alternative is considered unfeasible.	29º 37' 43.203'' S	17 º 57' 50.617'' E

In the case of linear activities:

Alternative:	Latitude (S):	Longitude (E):
Alternative S1 (preferred)		
• Starting point of the activity	29º 37' 34.870''	17º 57' 50.415''
• Middle/Additional point of the activity	29º 37' 53.837''	17º 57' 31.574''
• End point of the activity	29º 37' 32.792''	17º 57' 36.538''
Alternative S2 (if any)		
• Starting point of the activity	N/A	N/A
• Middle/Additional point of the activity	N/A	N/A
• End point of the activity	N/A	N/A
Alternative S3 (if any)		
• Starting point of the activity	N/A	N/A
• Middle/Additional point of the activity	N/A	N/A

• End point of the activity	N/A	N/A

For route alternatives that are longer than 500m, please provide an addendum with co-ordinates taken every 250 meters along the route for each alternative alignment.



Id	Longitude	Latitude
Start most northerly point = 0	17.96402097860	-29.62635788990
1	17.96332457830	-29.62633900280
2	17.96273771570	-29.62630965970
3	17.96212151000	-29.62628031660
4	17.96150530430	-29.62622163030
5	17.96095672770	-29.62617028270
6	17.96074159330	-29.62670618670
7	17.96056075430	-29.62716780220
8	17.96034516800	-29.62767635900
9	17.96016576380	-29.62815765800
10	17.95995637120	-29.62868589830
11	17.95972508760	-29.62928837780
12	17.95953948960	-29.62974523430
13	17.95930630240	-29.63032106390
14	17.95908263310	-29.63088261670
15	17.95886372270	-29.63142513380
16	17.95858104270	-29.63215800780
17	17.95830978420	-29.63283853360
18	17.95804328450	-29.63351905950
19	17.95773681000	-29.63428334240
20	17.95743699790	-29.63503525200
21	17.95722475000	-29.63557872090
22	17.95701535740	-29.63608316670
23	17.95682500050	-29.63657809460
24	17.95665843820	-29.63698260290
25	17.95642525110	-29.63757746820
26	17.95618730500	-29.63817709240
27	17.95596363560	-29.63874816300
28	17.95586732420	-29.63895171980
29	17.95613019790	-29.63910032320
30	17.95655374200	-29.63930686040
31	17.95694397360	-29.63951149410
32	17.95738179440	-29.63972564560
33	17.95781961520	-29.63994931490
34	17.95820157550	-29.64013669140
35	17.95859531950	-29.64059176940
36	17.95889513160	-29.64095820640
37	17.95926156860	-29.64137699150
38	17.95958327170	-29.64175389810
39	17.95990687840	-29.64212985300
End at substation = 40	17.96014178800	-29.64240669720

In the case of an area being under application, please provide the co-ordinates of the corners of the site as indicated on the lay-out map provided in Appendix A.

b) Lay-out alternatives

Alternative 1 (preferred alternative) – Fixed PV Solar		
Description	Lat (DDMMSS)	Long (DDMMSS)
The final layout of the proposed fixed solar array will respond to the environmental sensitivity of the site. By preference the modules for the array will be placed in the low to medium sensitivity areas as indicated in Appendix A4 - Ecological Sensitivity, A5 – Categories of Ecological Sensitivity and Appendix C – Facility Illustration. The final layout of the array will adhere to the following criteria: (1) Areas of lowest sensitivity will be identified and prioritised as the most suitable areas for the proposed	29º 37' 43.203'' S	17 º 57' 50.617'' E

array, see Appendix A4 - Ecological Sensitivity & A5 – Categories of Ecological Sensitivity. (2) Once all low sensitivity areas have been filled medium sensitivity areas will be filled to accommodate the proposed <20MW solar facility, see Appendix A4 - Ecological Sensitivity & A5 – Categories of Ecological Sensitivity. (3) The final layout will be selected hierarchically starting with the lowest areas outside the 50m buffer area from the town of Carolusberg and then sequentially with increasing altitude and increasing distance from the residential area of Carolusberg, see Appendix D – Specialist Reports (Visual Sensitivity). The array will remain below the 1080m contour line as prescribed in the VIA to avoid and / or mitigate visual pollution. (4) Flat to gently undulating areas will be selected as suitable while steep and rocky ground will be avoided, see Appendix A4 - Ecological Sensitivity & A5 – Categories of Ecological Sensitivity. (5) Areas within 32m of a drainage line will be avoided, see Appendix A4 - Ecological Sensitivity & A5 – Categories of Ecological Sensitivity. To summarise, the spatial layout of the proposed facility will be selected through a hierarchical framework that responds to the sensitivity of the site, topography and visual receptors.		
Alternative S2 – PV Solar Tracking System		
Description	Lat (DDMMSS)	Long (DDMMSS)
The final layout of the proposed tracking solar array will respond to the environmental sensitivity of the site. By preference the modules for the array will be placed in the low to medium sensitivity areas as indicated in Appendix A4 - Ecological Sensitivity, A5 – Categories of Ecological Sensitivity and Appendix C – Facility Illustration. The final layout of the array will adhere to the following criteria: (1) Areas of lowest sensitivity will be identified and prioritised as the most suitable areas for the proposed array, see Appendix A4 - Ecological Sensitivity & A5 – Categories of Ecological Sensitivity. (2) Once all low sensitivity areas have been filled medium sensitivity areas will be filled to accommodate the proposed <20MW solar facility, see Appendix A4 - Ecological Sensitivity & A5 – Categories of Ecological Sensitivity. (3) The final layout will be selected hierarchically starting with the lowest areas most distant from the town of Carolusberg and then sequentially with increasing altitude and increasing distance from the residential		

area of Carolusberg, see Appendix D – Specialist Reports (Visual Sensitivity). The array will remain below the 1080m contour line as prescribed in the VIA to avoid and mitigate visual impact from key receptors in the surrounding landscape. (4) Flat to gently undulating areas will be selected as suitable while steep and rocky ground will be avoided, see Appendix A4 - Ecological Sensitivity & A5 – Categories of Ecological Sensitivity. (5) Areas within 32m of a drainage line will be avoided, see Appendix A4 - Ecological Sensitivity & A5 – Categories of Ecological Sensitivity. To summarise, the spatial layout of the proposed facility will be selected through a hierarchical framework that responds to the sensitivity of the site, topography and visual receptors.		
Alternative S3		
Description	Lat (DDMMSS)	Long (DDMMSS)
No Go Alternative - To pursue the no go option is not considered feasible. From an economic perspective this landuse option is aligned with international, national, provincial, local and fine scale forward planning - the intensive use of land for the generation of renewable energy does translate into the most economically sustainable landuse for this marginal agricultural locality. The opportunity cost weighs in favour of the proposed development due to the suitability of the site for the proposed development from a heritage and visual impact perspective, conservation status of the ecosystem type, low potential impact of the development where approx. 6.5% of the land surface of the property can supply enough additional income to make the development economically viable for the landowner. Furthermore the transformation of <20 ha's of primarily transformed and/or degraded habitat will not impair the quality of biodiversity pattern or process assets on the site. The area is economically active due to its suitability for the extensive grazing of small stock, however returns from this landuse are marginal at best in these arid ecosystems. Sustainable landuse options for people in this location are therefore very limited and in our consultation appear to be closely linked to the ability of a landowner to diversify the income streams into the property to attain a position where the property becomes a viable business.. Fundamentally it appears that it would be at odds with international commitments in terms of the use of renewable energy, the forward planning of National Government, the PSDF and DF, IDP. For these reasons the no-go alternative is considered unfeasible.	29º 37' 43.203'' S	17 º 57' 50.617'' E

c) Technology alternatives

Alternative 1 (preferred alternative) – Fixed PV Solar
Current technological alternatives for renewable energy generation from site such as these could conceivably include PV Solar, Concentrated Solar Power (CSP) and through wind turbines. When considering PV Solar technology alternatives would be associated with selecting the most efficient panel for the proposed site as solar panel efficiencies are improving rapidly through a dedicated research and development drive. What is noteworthy though is that the impact posed by the different PV solar technologies would not alter the potential environmental impact posed by the facility in any meaningful way. The PV technologies are therefore generally equivalent in terms of their potential impacts. As discussed in more detail above, this would hold true for all the phases of a project such as this, planning, site preparation, construction, operation and decommissioning. CSP is not considered a viable alternative as it requires significant quantities of water, which is not freely available on this site and is considered inappropriate in this semi-arid / water stressed environment. The scale of the construction of CSP over PV Solar is an additional consideration here as a CSP plant is a larger, more expensive and more complex facility to construct and maintain. The site additionally does not lend itself to power generation from wind. Primarily due to the much larger visual impact and due to the lack of an adequate resource. The most appropriate technology is clearly a fixed PV Solar Array, alternative technologies mentioned above were therefore not considered feasible in this instance.
Alternative S2 – PV Solar Tracking System
The deployment of the PV array could be either via a fixed mounting or as a tracking system. The tracking system would require a larger area to achieve the same power generation i.e. it is more "hungry" in terms of the ha to power ratio. It therefore would be less desirable in this instance where suitable low to medium sensitivity areas for the solar PV are at a premium. The construction and maintenance on a tracking system are additional constraints in that they are more complex to build, maintain and are more costly.
Alternative S3
N/A

d) Other alternatives (e.g. scheduling, demand, input, scale and design alternatives)

Alternative 1 (preferred alternative)		
Alternative 2		
Alternative 3		

e) No-go alternative

No Go Alternative - To pursue the no go option is not considered feasible. From an economic perspective this landuse option is aligned with international, national, provincial, local and fine scale forward planning - the intensive use of land for the generation of renewable energy does translate into the most economically sustainable landuse for this marginal agricultural locality. The opportunity cost

weighs in favour of the proposed development due to the suitability of the site for the proposed development from a heritage and visual impact perspective, conservation status of the ecosystem type, low potential impact of the development where approx. 6.5% of the land surface of the property can supply enough additional income to make the development economically viable for the landowner. Furthermore the transformation of <20 ha's of primarily transformed and/or degraded habitat will not impair the quality of biodiversity pattern or process assets on the site. The area is economically active due to its suitability for the extensive grazing of small stock, however returns from this landuse are marginal at best in these arid ecosystems. Sustainable landuse options for people in this location are therefore very limited and in our consultation appear to be closely linked to the ability of a landowner to diversify the income streams into the property to attain a position where the property becomes a viable business.. Fundamentally it appears that it would be at odds with international commitments in terms of the use of renewable energy, the forward planning of National Government, the PSDF and DF, IDP. For these reasons the no-go alternative is considered unfeasible.

Paragraphs 3 – 13 below should be completed for each alternative.

3. PHYSICAL SIZE OF THE ACTIVITY

a) Indicate the physical size of the preferred activity/technology as well as alternative activities/technologies (footprints):

Alternative:	Size of the activity:
Alternative A1[1] (preferred activity alternative)	<200 000 m²
Alternative A2 (if any)	m²
Alternative A3 (if any)	m²

or, for linear activities:

Alternative:	Length of the activity:
Alternative A1 (preferred activity alternative)	2373 m
Alternative A2 (if any)	m
Alternative A3 (if any)	m

b) Indicate the size of the alternative sites or servitudes (within which the above footprints will occur):

Alternative:	Size of the site/servitude:
Alternative A1 (preferred activity alternative)	66kV: 580m x 11m = 6380 m² 132kV: 580m x 15.5m = 8990 m²
Alternative A2 (if any)	N/Am²
Alternative A3 (if any)	N/Am²

4. SITE ACCESS

Does ready access to the site exist?	YES√	NO

[1] "Alternative A.." refer to activity, process, technology or other alternatives.

If NO, what is the distance over which a new access road will be built | m |

Describe the type of access road planned:

As can be seen in Appendix A1 – Locality Map, access to the site may be reached either by travelling from the centre of the town of Springbok, eastward on Voortrekker Street which later becomes the N14 as it exits the town to the east. Travel on the N14 for 5.7 km to the Carolusberg turn-off, here turn left and travel 1.3 km east passing Carolusberg to the south. At this point there is a gravel road which turns left and northwards, follow this road for 1.3 km, access to the property may be gained via a farm track to a gate on the left

Include the position of the access road on the site plan and required map, as well as an indication of the road in relation to the site.

5. LOCALITY MAP

An A3 locality map must be attached to the back of this document, as Appendix A. The scale of the locality map must be relevant to the size of the development (at least 1:50 000. For linear activities of more than 25 kilometres, a smaller scale e.g. 1:250 000 can be used. The scale must be indicated on the map.). The map must indicate the following:

- an accurate indication of the project site position as well as the positions of the alternative sites, if any;
- indication of all the alternatives identified;
- closest town(s;)
- road access from all major roads in the area;
- road names or numbers of all major roads as well as the roads that provide access to the site(s);
- all roads within a 1km radius of the site or alternative sites; and
- a north arrow;
- a legend; and
- locality GPS co-ordinates (Indicate the position of the activity using the latitude and longitude of the centre point of the site for each alternative site. The co-ordinates should be in degrees and decimal minutes. The minutes should have at least three decimals to ensure adequate accuracy. The projection that must be used in all cases is the WGS84 spheroid in a national or local projection).

6. LAYOUT/ROUTE PLAN

A detailed site or route plan(s) must be prepared for each alternative site or alternative activity. It must be attached as Appendix A to this document.

The site or route plans must indicate the following:

- the property boundaries and numbers of all the properties within 50 metres of the site;
- the current land use as well as the land use zoning of the site;
- the current land use as well as the land use zoning each of the properties adjoining the site or sites;
- the exact position of each listed activity applied for (including alternatives);
- servitude(s) indicating the purpose of the servitude;
- a legend; and

- a north arrow.

7. SENSITIVITY MAP

The layout/route plan as indicated above must be overlain with a sensitivity map that indicates all the sensitive areas associated with the site, including, but not limited to:

- watercourses;
- the 1:100 year flood line (where available or where it is required by DWA);
- ridges;
- cultural and historical features;
- areas with indigenous vegetation (even if it is degraded or infested with alien species); and
- critical biodiversity areas.

The sensitivity map must also cover areas within 100m of the site and must be attached in Appendix A.

8. SITE PHOTOGRAPHS

Colour photographs from the centre of the site must be taken in at least the eight major compass directions with a description of each photograph. Photographs must be attached under Appendix B to this report. It must be supplemented with additional photographs of relevant features on the site, if applicable.

9. FACILITY ILLUSTRATION

A detailed illustration of the activity must be provided at a scale of at least 1:200 as Appendix C for activities that include structures. The illustrations must be to scale and must represent a realistic image of the planned activity. The illustration must give a representative view of the activity.

10. ACTIVITY MOTIVATION

Motivate and explain the need and desirability of the activity (including demand for the activity):

1. Is the activity permitted in terms of the property's existing land use rights?	YES	NO√	Please explain
The property is currently zoned as Agriculture 1. If this application is successful then it is the proponents understanding that a consent use application will be applied for as this activity does not require rezoning to an alternative landuse.			

2. Will the activity be in line with the following?			
(a) Provincial Spatial Development Framework (PSDF)	YES√	NO	Please explain

Section B14 of the Northern Cape Provincial Spatial Development Framework (NCPSDF) makes mention of the fact that the province has the lowest contribution to National GDP of any of the provinces, the province in the region of the proposed solar facility however has some of the highest potential nationally as an area able to provide renewable energy to South Africa.

Section B14.4 The proposed development would therefore be aligned with the area as one that is highly suitable for the generation of renewable energy and by that virtue aligned with the national objective to generate contribute to Local Economic Development of the province as a whole through the provision of energy.

The proposed development would additionally be aligned with the NCPSDF section C6.2 and the premise of partnerships between government and the private sector where these partnerships have the potential to return significant socio economic returns and where they contribute to the provision of basic human needs programmes. In Section 6.2.3.1 and Map C5 the NCPSDF makes mention of the fact that the area being considered for the proposed development is additionally identified as an area that has high potential for development based on its available resources. The proposed development would additionally be aligned with the desired investment as articulated in Section 6.2.3.3 In particular the desired infrastructural capital investment which should use "technologies and processes in an efficient manner", have "zero waste and zero emissions production systems" and provide "improvements in product systems (eco-efficiency and eco-innovation)". As an area with high potential as noted above the desired investment would be in infrastructure as articulated in Section 6.2.4. which shows alignment between the proposed development and the desired investment for the area.

The proposed development however is primarily aligned to the desired objectives stated in Section 8.2.3. Energy Objectives of the NCPSDF including:

- Promote the development of renewable energy supply schemes. Large-scale renewable energy supply schemes are strategically important for increasing the diversity of domestic energy supplies and avoiding energy imports while minimizing detrimental environmental impacts.
- There is a national electricity supply shortage and the country is now in a position where it needs to commission additional plants urgently. Consequently, renewable energy projects are a high priority.
- Develop and institute innovative new energy technologies to improve access to reliable, sustainable and affordable energy services with the objective to realize sustainable economic growth and development. The goals of securing supply, providing energy services, tackling climate change, avoiding air pollution and reaching sustainable development in the province offer both opportunities and synergies which require joint planning between local and provincial government as well as the private sector.
- Develop and institute energy supply schemes with the aim to contribute to the achievement of the targets set by the White Paper on Renewable Energy (2003). This target relates to the delivery of 10 000 GWh of energy from renewable energy sources (mainly biomass, wind, solar, and small-scale hydro) by 2013.

(b) Urban edge / Edge of Built environment for the area	YES√	NO	Please explain
The proposed development is located outside the urban edge. The site is currently used for extensive grazing of small livestock. The bulk of the property will remain suitable for this form of landuse, the proposed development will therefore not preclude the owner from continuing this landuse in parallel with the generation of electricity.			
(c) Integrated Development Plan (IDP) and Spatial Development Framework (SDF) of the Local Municipality (e.g. would the approval of this application compromise the integrity of the existing approved and credible municipal IDP and SDF?).	YES	NO√	Please explain
The proposed development would be contributing and directly aligned with the following Nama Khoi Municipality Integrated Development Plan (2013 – 2014) Objectives: • Provide services that are sustainable • Promote social and economic development • Promote a safe and healthy environment Additionally in the SWOT analysis undertaken for the NKM IDP 2013-2014 the municipality has identified the development of solar power plants as a key opportunity. Furthermore the needs analysis for the town of Carolusberg, which is adjacent to the proposed development indicates that the main electricity sub-station requires an upgrade. The proposed development is finally aligned with the articulated summary of needs in terms of infrastructure development within the Nama Khoi jurisdictional area these include the provision of electricity, the upgrade of electricity supply and under economic needs, the facilitation of job creation, improved infrastructure provision, the promotion of business development, support to existing government projects, the promotion of private / public partnerships to achieve these outcomes.			
(d) Approved Structure Plan of the Municipality	YES	NO	Please explain
NOT AVAILBALE			
(e) An Environmental Management Framework (EMF) adopted by the Department (e.g. Would the approval of this application compromise the integrity of the existing environmental management priorities for the area and if so, can it be justified in terms of sustainability considerations?)	YES	NO	Please explain
NOT AVAILBALE – The overarching planning contained in the NCPSDF appears to be the only plan available at the present time. It does make provision for the integration of environmental spatial planning categories with other developmental needs in the local authorities within its jurisdiction. The areas assessed fall outside Critical Biodiversity Areas (Namaqua District Municipality Biodiversity Sector Plan) and National Freshwater Ecosystem Areas (SANBI GIS data layer).			
(f) Any other Plans (e.g. Guide Plan)	YES√	NO	Please explain
As stated above the Biodiversity Sector Plan for the Namaqua District Municipality has been compiled. The proposed areas identified for the development fall outside all areas identified as Critical Biodiversity Areas. Additionally the areas identified do not overlap in any way with National Freshwater Ecosystem Priority Areas or gazetted endangered ecosystems in terms of the Gazetted Notice 1477 of 2009 .			

The White Paper on Energy Policy for the RSA (1998) gives recognition to "renewable sources" in their own right; are not limited to small scale and remote applications, and that they have medium to long term commercial potential". Furthermore that "Renewable resources generally operate from an unlimited resource base and, as such, can increasingly contribute towards a long term sustainable energy future for South Africa. The proposed facility is aligned with these aims.
The White Paper on Renewable Energy (2003) - As signatory to the Kyoto Protocol, Government is determined to, by means of the White Paper on Renewable Energy (November, 2003): a) make good the country's commitment to reduce greenhouse gas emissions, and b) ensure energy security through diversification of supply (National Energy Act). Government's long-term goal is to establish a renewable energy industry that will offer in future sustainable, fully non-subsidised alternatives to fossil fuels. The medium-term (10-year) target set in the White Paper is 10 000 GWh renewable energy contribution to final energy consumption by 2013, to be produced mainly from biomass, wind, solar and small-scale hydro electrical plants. This target constitutes 4% of the total projected demand. The proposed Melkboskuil Solar Facility supports government's medium and long term renewable energy goals as it will assist to make good the country's greenhouse gas emissions and ensure energy security. The proposed facility is aligned with these aims.
The National Energy Act (2008) promotes diversification of energy sources and supply including renewable resources, i.e. solar and wind. The diversified energy resources have to be available in sustainable quantities at affordable prices and should support economic growth, poverty alleviation and consider the preservation of the environment. The proposed facility is aligned with these aims.
The National Alternative Energy Strategy (2009) - South Africa's government has identified around 20GW of pure renewable energy capacity and 4GW of cogeneration technologies that may form part of its renewable energy procurement plan under the region's feed-in tariff programme. Concentrated solar power accounted ten percent (10%) of proposed capacity. The proposed solar facility contributes to this capacity.

The National Spatial Development Framework (2006) - To National Spatial Development Framework serves as instrument to coordinate all government action and to align social, economic and environmental goals. The National Spatial Development Framework provides the basis to maximize the overall social and economic impact of government development investment through interpreting the strategic direction, policy coordination and combining government action into a continuous spatial framework of reference.

The ultimate goal is to provide basic services, to ameliorate poverty and undo uneven and ineffective spatial patterns and address the additional burden on poor people.

The proposed Melkboskuil Solar Facility, Springbok complies with the normative principles of the National Spatial Development Framework in the following ways:

a) Economic growth is a pre-requisite to achieve policy objectives – the site will contribute to the GDP of the country

b) Government spending on fixed investment should be focussed on localities of economic growth or economic potential – the Northern Cape has been identified as a key area for renewable energy development

c) Effort to address past and current social inequalities should focus on people not places – the creation of jobs and skills development is an outcome.

d) To overcome spatial distortions of apartheid, future settlement and economic development opportunities should be channelled into corridors and nodes that are adjacent to or link the main economic growth centres – there is clear alignment with the growth corridor and centres identified in the Northern Cape, see above.

e) Future urban and rural development in the province should change the current pattern of resource application and investment significantly to ensure a sustainable environment for the future. Infrastructure investment and development spending should primarily support localities that will become major growth nodes in South Africa - The resource application and investment are aligned with national energy strategies and enhance the resource base of the Nama-Khoi Municipality.

3. Is the land use (associated with the activity being applied for) considered within the timeframe intended by the existing approved SDF agreed to by the relevant environmental authority (i.e. is the proposed development in line with the projects and programmes identified as priorities within the credible IDP)?	YES√	NO	Please explain

As stated above the municipality does not have an approved SDF. The alignment with the IDP is as follows:

The proposed development would be contributing and directly aligned with the following Nama Khoi Municipality Integrated Development Plan (2013 – 2014) (IDP) Objectives:

- Provide services that are sustainable
- Promote social and economic development
- Promote a safe and healthy environment

Additionally in the SWOT analysis undertaken for the NKM IDP 2013-2014 the municipality has identified the development of solar power plants as a key opportunity. Furthermore the needs analysis for the town of Carolusberg, which is adjacent to the proposed development indicates that the main electricity sub-station requires an upgrade.

The proposed development is finally aligned with the articulated summary of needs in terms of infrastructure development within the Nama Khoi jurisdictional area these include the provision of electricity, the upgrade of electricity supply and under economic needs, the facilitation of job creation, improved infrastructure provision, the promotion of business development, support to existing government projects, the promotion of private / public partnerships.

4. Does the community/area need the activity and the associated land use concerned (is it a societal priority)? (This refers to the strategic as well as local level (e.g. development is a national priority, but within a specific local context it could be inappropriate.)	YES√	NO	Please explain

A development such as this speaks directly to the guiding principles of sustainability in development in particular the current challenge of climatic change. It addresses all three pillars of sustainability in development. It directly impacts on the economic leg of sustainability through the provision of sustainable green energy and the economic efficiency (in terms of total cost of all downstream impacts) that this form of energy will deliver once mainstreamed. Particularly it contributes to the current challenges ESKOM is experiencing in providing sufficient energy to South Africa. Indirectly it contributes to ecological sustainability through the avoidance of impacts resulting from the consumption of fossil fuels and through the provision of clean energy contributes to social equity through the provision of a physical and moral space where the continuity of a complex society and ecology is sought to be maintained and enhanced, and its health attained.

The proposed development is aligned with the Normative Principles of the National Spatial Development Perspective in that it represents a rural development that changes the current pattern of resource use and in so doing reduces in a meaningful way the consumption of fossil fuels and when interpreted in light of climate change benefits future generations through the switch to sustainable green energy.

The proposed development will respond to a key planning issue related to the integration of uses as it represents a opportunity to promote mixed use landuse management and in particular the stated aim to maximize the utilization of resources for economic gain in this instance the resource sustainable green energy.

This development is responding to an international, national, provincial and local authority priority. At an international level the switch to a green economy is seen as a strategic response to climate change and escalating atmospheric concentrations of CO_2 from the combustion of fossil fuels. At a provincial level the proposed development is aligned with the Growth and Development Strategy as it promotes growth, diversification and transformation of the provincial economy and through social development is able to address poverty reduction. To achieve these will require that human and social capital is developed, improving efficiencies in governance and importantly development management, improvement, expansion and enhancement of required infrastructure to facilitate social and economic growth. As outlined above the proposed project is a case of diversification of the economy in a low potential extensive agricultural landscape and a necessary and required infrastructure development. In particular the project would contribute directly to energy sector related infrastructure and consequent strengthening and promotion of the green economy. At all scales from National to local level the Achilles heel for development is the provision of inexpensive energy to service and expand development. This development would directly contribute to addressing this key constraint through the provision of green energy.

At a local scale seventy three percent (72.9%) of the population are of employable age (between 15 and 65) (Census 2001). Fourty seven percent (47% or 12269 persons) of the employable population are employed, whilst 9.3% (or 2428 persons) are unemployed and discouraged work-seekers. Fourty four percent (43.7% or 11408 persons) of the population is not economically active. The proposed development will provide an opportunity for temporary and permanent employment, thus addressing this critical concern.

5. Are the necessary services with adequate capacity currently available (at the time of application), or must additional capacity be created to cater for the development? (Confirmation by the relevant Municipality in this regard must be attached to the final Basic Assessment Report as Appendix I.)	YES	NO	Please explain
Discussions are underway with the Nama Khoi Municipality for the provision of water to service and maintain the proposed solar PV array.			
6. Is this development provided for in the infrastructure planning of the municipality, and if not what will the implication be on the infrastructure planning of the municipality (priority and placement of services and opportunity costs)? (Comment by the relevant Municipality in this regard must be attached to the final Basic Assessment Report as Appendix I.)	YES	NO√	Please explain
There are a number of energy related infrastructure projects planned for the Nama Khoi Municipality. However it must be noted that this is a development by a private developer that will assist in the provision of electricity infrastructure and not a development that is being considered by the municipality. The project does not therefore appear in the infrastructure planning priorities of the local authority. The implication will be that the municipality will through a partnership with the private sector manage to exceed the goals set for the delivery of energy related infrastructure if the projects identified in the IDP are achieved.			
7. Is this project part of a national programme to address an issue of national concern or importance?	YES√	NO	Please explain
Yes the proposed project is fully aligned with the Department of Minerals and Energy established target for 10 000 GWh of renewable energy by December 2013. Projected benefits to South Africa for achieving this target are: • Add about 1.667MW new renewable energy capacity, with a net impact on GDP as high as R1.071-billion a year; • Create additional government revenue of R299-million; • Stimulate additional income that will flow to low-income households by as much as R128-million, • Creating just over 20 000 new jobs; and • Contribute to water savings of 16.5-million kilolitres, which translates into a R26.6-million saving. Furthermore a target of 17.8 GW has been set for energy provision from renewable sources by 2030. This target has been included in the Integrated resource Plan 2010 and the IPP Procurement Programme. Additionally the development of renewable energy will grow organically and in a spatially decentralised manner throughout the country which will contribute to the stabilisation and strengthening of electricity supply to consumers while reducing costs associated with the transmission of electricity over significant distances.			

8. Do location factors favour this land use (associated with the activity applied for) at this place? (This relates to the contextualisation of the proposed land use on this site within its broader context.)	YES√	NO	Please explain

The farms in this area are low to marginal agricultural concerns, this due to the low returns associated with the husbandry of small stock on veld with a low carrying capacity. This is a mountainous property that has no commercially viable agricultural soils thus characteristically focussed on extensive agriculture. The site is highly suited for the generation of energy from PV Solar as shown by the irradiation yields measured. Moreover it will not impact on any important archaeology and in an ecosystem type that is not regarded as threatened and even though it is located in an ecological support area the proposed development will not impact on the provision of ecosystem goods and services as the landscape is characterised by extensive areas of similar connected habitat. It represents a viable economic landuse able to supply renewable energy to supplement the energy requirement of South Africa in line with a national programme.

From a practical perspective the site is easily accessed from well developed road infrastructure from the town of Springbok and the N7. The site is for the most part flat to gently undulating which will not require extensive earthworks and associated environmental impacts. Finally the site is located close to an existing ESKOM substation, connectivity to the grid is therefore an additional advantage for this site.

9. Is the development the best practicable environmental option for this land/site?	YES√	NO	Please explain

Considering the limited agriculturally based economic opportunities available to people within this landscape this proposed development represents a viable diversification of the income streams into these businesses, it is based on a “green” technology that in this instance will not impact on the sense of place, will not cause noise or other forms of pollution, which is located in an area particularly suited to energy generation from solar power and in a unthreatened ecosystem where unavoidable impacts are highly localised and due to the “intactness” of the surrounding vegetation probably reversible. Key here is that the current landuse on the site can continue in parallel i.e. the bulk of the site remains viable for utilisation by small stock.

Additionally it appears to be fully aligned with the forward planning for the area, able to deliver on key infrastructure; and economic needs of the local authority, provincial government and the national government. For these reasons in our estimation the proposed development is the best practicable environmental option for this site.

10. Will the benefits of the proposed land use/development outweigh the negative impacts of it?	YES√	NO	Please explain
From an ecosystem point of view the proposed development will be located in a non-threatened ecosystem, well away from any important terrestrial or sensitive aquatic ecosystems, it is the type of development that if decommissioned can be fully dismantled and removed, it supplies and alternative and more viable economic opportunity to people who live and work in a marginal agricultural area, the site has low sensitivity visually once mitigation has been implemented, produces no noise or pollutants and supplements energy provision in line with national strategies to provide energy to civil society in South Africa. Additionally the loss of biodiversity in this instance is further mitigated by the inherent character of the property itself. This is a property which has large areas of the same ecosystem that is well connected and well connected to the very large areas of the same on neighbouring farms. The areas assessed have been impacted by agriculture and are degraded. Much of these areas have limited to no potential as agricultural production areas and will remain pristine for the foreseeable future if not overgrazed and for all intents and purposes would fulfil the function of Ecological Support Areas. The loss of natural vegetation versus the benefit of establishing a sustainable income from a low potential agricultural farm from a renewable source with the livelihoods that it would support and be beneficial too, points to an opportunity cost that would favour the proposed development.			
11. Will the proposed land use/development set a precedent for similar activities in the area (local municipality)?	YES	NO√	Please explain
No it is our understanding that similar projects have already been authorised by the competent authority in the area, see NEAS Ref : DEA/EIA/000130/2012, DEA Ref : 14/12/16/3/3/511.			
12. Will any person's rights be negatively affected by the proposed activity/ies?	YES	NO√	Please explain
The proposed development is located on private land and with the full consent of the landowner and will thus not infringe on any rights from this perspective. The site will not produce any waste or pollution and will therefore not have a physical effect beyond the boundaries of the property. See also Appendix J – Owners Consent			
13. Will the proposed activity/ies compromise the "urban edge" as defined by the local municipality?	YES	NO√	Please explain
Located outside of the urban edge on an agricultural farm zoned Agriculture 1.			
14. Will the proposed activity/ies contribute to any of the 17 Strategic Integrated Projects (SIPS)?	YES√	NO	Please explain
The Strategic Integrated Projects (SIPS) address the provision of bulk infrastructure for electricity to support and stimulate Local Economic Development (LED) in particular SIP 8 : Green Energy in Support of the South African Economy, SIP 9 : Electricity transmission and distribution for all and SIP 10: Electricity development to support LED.			

15. What will the benefits be to society in general and to the local communities?	Please explain

PV Solar is fed directly into the grid and therefore is immediately available for distribution via the national grid. As one of the preferred bidders the proponent through the proposed development would be contributing directly to the achievement of the 10 000 GWh target set by national government for December 2013. As such it would be contributing directly to the same outcomes, namely:

- Add about 1.667MW new renewable energy capacity, with a net impact on GDP as high as R1.071-billion a year;
- Create additional government revenue of R299-million;
- Stimulate additional income that will flow to low-income households by as much as R128-million,
- Creating just over 20 000 new jobs; and
- Contribute to water savings of 16.5-million kilolitres, which translates into a R26.6-million saving.

Furthermore the applicant if successful in the bid would be contributing directly to local job creation, during planning (local planning expertise used), during construction and the stimulation of the service industry that would be required for the maintenance and repair of these facilities during the operational phase.

Furthermore as a green energy producer the applicant would be contributing to the reduction of dependency on fossil fuels, reduced Carbon Footprint, produced levels of pollution thus in general to society at large providing a cleaner and environmentally safer means of energy generation than current fossil fuel based technologies.

16. Any other need and desirability considerations related to the proposed activity?	Please explain

The Northern Cape as a whole is characterised by the fact that it is the smallest economy in the country. However it has the greatest potential as a renewable energy generating hub with enough high radiation area to service the energy demand in SA. The potential at a province wide level is therefore to provide the area with the means to contribute significantly to the national economy.

17. How does the project fit into the National Development Plan for 2030?	Please explain

The project would contribute directly to the vision expressed in Chapter 4: Economic Infrastructure and in particular the vision which speaks to the Energy Sector. The vision articulated at the beginning of this chapter is the following:

By 2030, South Africa will have an energy sector that promotes:

- Economic growth and development through adequate investment in energy infrastructure and the provision of quality energy services that are competitively priced, reliable and efficient.
- Social equity through expanded access to energy services, with affordable tariffs and well targeted and sustainable subsidies for households.
- Environmental sustainability through efforts to reduce pollution and mitigate the effects of climate change.

Clearly this proposed project is aligned with and has the ability to deliver on this vision.

18. Please describe how the general objectives of Integrated Environmental Management as set out in section 23 of NEMA have been taken into account.

1. to promote the application of appropriate environmental management tools in order to ensure the integrated environmental management of activities.

This is addressed through the provision of an Environmental Management Programme (EMPr) with this Basic Assessment Report where the roles and responsibilities of the applicant and the Environmental Control Officer (ECO) are articulated in detail to ensure that the development of the vineyard production area happens in an integrated and well managed fashion.

2 (a) promote the integration of the principles of environmental management set out in section 2 into the making of all decisions which may have a significant effect on the environment;

Ensuring that the recommendations for mitigation of environmental impact contained within this report under Section F adhere to the principles of a precautionary approach that aims first to avoid environmental impact and secondly where impacts are unavoidable to mitigate environmental impact for an activity that will have significant impact on the environment. To consider the opportunity cost in proceeding with the development above. Furthermore that these mitigatory measures are made practicably implementable in the EMPr and monitored to ensure compliance. Finally to recognise in the recommendations supplied that the environment is interlinked and to give adequate consideration to these linkages and how they proposed development may impact over the short term but also cumulatively over the long term.

(b) identify, predict and evaluate the actual and potential impact on the environment, socioeconomic conditions and cultural heritage, the risks and consequences and alternatives and options for mitigation of activities, with a view to minimising negative impacts, maximising benefits, and promoting compliance with the principles of environmental management set out in section 2;

The identification of potential impacts is contained under Section F of this report. The evaluation of the identified impact follows a process of predicting the actual or potential impact in terms of sustainability criteria for each of the alternatives being considered. Thereafter the impact is quantified is terms of its severity in the absence of any mitigatory measures to avoid an impact, mitigation measures are then proposed that would or could reduce the impacts to within acceptable levels, in instances where environmental impacts cannot be suitably mitigated to weigh the opportunity costs of proceeding against those of the potential benefit to people and the economy, to evaluate the linkages that exist between identified impact and determine if these linkages have the potential to amplify impact through synergies that may exist between them and after this process always follow the option that delivers the best possible benefit for the least possible impact. In instances where the cost significantly outweighs the opportunity to consider a recommendation for not proceeding with the proposed development.

(c) ensure that the effects of activities on the environment receive adequate consideration before actions are taken in connection with them;

This is addressed through the process of identifying and evaluating environmental impacts either individually or through complimentary associations that may amplify the severity of impacts. Proposing mitigatory measures and translating those mitigatory measures into practically implementable actions within an EMPr and incorporating potential offsets that may contribute dealing with the loss of biodiversity attendant to the proposed development.

(d) ensure adequate and appropriate opportunity for public participation in decisions that may affect the environment;

To follow the guidelines for public participation in accordance with the requirements of NEMA legislation, to honour and reflect all reasonable objections raised by key stakeholders and other interested and affected parties, to propose solutions to address those concerns and present them for further comment in the BAR. To resolve all reasonable objections as a matter of process.

(e) ensure the consideration of environmental attributes in management and decision-making which may have a significant effect on the environment; and

This is addressed through the provision of an EMPr that must be implemented as part of the operational and maintenance phase of the development.

(f) identify and employ the modes of environmental management best suited to ensuring that a particular activity is pursued in accordance with the principles of environmental management set out in section 2.

This is addressed through the provision of an EMPr that must be implemented as part of the operational and maintenance phase of the development.

19. Please describe how the principles of environmental management as set out in section 2 of NEMA have been taken into account.
Section 2 of NEMA is addressed through the involvement of all key government stakeholders in the public participation process to allow time and opportunity for them to adequately comment on a proposal and act on their mandate to respect, promote and protect people's social, developmental, physical, cultural and economic rights. The requirement is further addressed through the engagement with I&AP's as part of the public participation process, and the provision of an opportunity for all I&AP's the provide input into the assessment process and respond to all reasonable comments on an individual basis. Responses and decisions made must and do take cognisance of the individual concerns of I&AP's. Adherence to these principles are addressed through the execution of the Guidelines on Public Participation circulated by DEA&DP in August 2010. Consultation and consideration of the planning documentation of the DEA&DP, CapeNature, SANBI and the Local Authorities are also included to address this principle. As this assessment rests on the three tenets of sustainability adequate consideration is given to the interaction between the environment that forms the basis for the delivery of goods and services to the economic sector which in turn delivers social benefit and livelihoods to people. In particular that the process of assessment attempts first to avoid negative environmental impact (including pollution, disturbance to the landscape, impacts on cultural heritage, the generation of waste and its disposal) and if impacts are unavoidable to mitigate these impacts or remedied. Here the assessment would make use of the guideline on needs and desirability of the proposed development to assess the cost/benefit equation for the proposed development and through the evaluation of the different alternatives available to the proponent and through this process the determination of the best possible practically implementable alternative. The assessment will also address the type of resources being used whether renewable or non-renewable and assess the resource availability in terms of equitable distribution of resource allocation or to ensure that every effort is made to ensure that the demand on the resource does not exceed its ability to regenerate, as is the case with ecologically based environmental goods and services. Here too consideration will be given to the improvement of resource use efficiencies. In particular investigate the conservation status of the particular ecosystem or special habitat that may be impacted by the development by investigating the National Spatial Biodiversity Assessment, Biodiversity Sector Plan for the local authority, Fine-scale Conservation Plans and the listed ecosystems in Government Notice 1477 of 2009. Here also consideration is given to the DEA&DP Guideline on Alternatives for Aug 2010. To ensure that a precautionary approach is followed at all times with due consideration to knowledge gaps and assumptions that are made in relation to the proposed development. In instances where impacts are anticipated to ensure that these are mitigated or remedied to a point that they do not infringe on basic human rights. Furthermore this section of NEMA is addressed through the provision of an EMPr that aims to provide an integrated environmental management programme that recognises the linkages between environmental elements and puts forward the most applicable and practically reasonable means to achieve the objectives of the EMPr. In particular the EMPr must ensure environmental health and safety, not only to the broader community but also to workers involved in the execution of the activity to ensure that their rights are not ignored. As and where necessary include environmental education to skill those responsible for the implementation of the EMPr to undertake the required training to fully dispense with their responsibility in terms of requirements of the EMPr. The assessment addresses issues that extend well beyond the borders of the property concerned to ensure that environmental impacts resulting from a development are not disproportionately felt by a person while always ensuring that equitable access to environmental resources to meet basic human needs is ensured for all persons.

11. APPLICABLE LEGISLATION, POLICIES AND/OR GUIDELINES

List all legislation, policies and/or guidelines of any sphere of government that are applicable to the application as contemplated in the EIA regulations, if applicable:

Title of legislation, policy or guideline	Applicability to the project	Administering authority	Date
The Constitution of the Republic of South Africa (Act 108 of 1996)	(S2) Bill of Rights (S24) Environmental rights - the right to an environment that is not harmful to their health or well-being; and to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that – prevent pollution and ecological degradation;		
The National Environmental Management Act (NEMA) (Act 107 of 1998)	Environmental Impact Assessment (EIA) Regulations have been promulgated in terms of Chapter 5 of the Act. Everyone wishing to undertake an activity listed in these EIA Regulations (GN 385. 386 & 387 of 2006) needs an environmental authorization. S24(1) of the Act stipulates that the potential impact on the environment associated with these listed activities must be assessed and reported on to the competent authority. According to S28(1) – the Duty of Care Provision – the project proponent must ensure that reasonable measures are in place to ensure that pollution and or degradation of the environment are avoided, stopped and or minimised. This is applicable for the entire life cycle of the proposed solar energy facility.	Department of Environmental Affairs	Act 107 of 1998
The National Environmental Management : Biodiversity Act (Act 10 of 2004)	In terms of S 56(1) a list of threatened &protected species has been published in Government Gazette 29657; Additionally to this; GN R 150 (Commencement of	Department of Environmental Affairs	Act 10 of 2004

	Threatened and Protected Species Regulations, 2007), GN R 151 (list of critically endangered, vulnerable and protected species) and GN R 152 (Threatened or protected Species Regulations) has been published. Under this Act, a permit must be required for any activity which may negatively impact on the survival of a listed protected species.		
Environmental Conservation Act (Act 73 of 1989)	National Noise Control Regulations (GN R154 – 10th January 1992)	Department of Environmental Affairs, NC Department of Environment and Nature Conservation as well as the Local Authorities	Act 73 of 1989
National Water Act No 36 of 1998	S19 – Duty of Care that stipulate that the project proponent must ensure that reasonable measures are in place to prevent and mitigate to effect of pollution of water resources. S20 – describe the procedures to follow in a emergency impact that may impact on a water resource. S21 – Definition of water use. S22 – Any water use that is not Schedule 1 as stipulated in terms of this Section must be authorised. S151 - unlawfully and intentionally or negligently commit any act or omission which detrimentally affects or is likely to affect a water resource.". A "water resource include "a water course, surface water, estuary or aquifer".	Department of Water Affairs	Act 36 of 1998
National Heritage Resources Act (Act No 25 of 1999)	S38 - Stipulate that any person who intends to undertake a development such as-(*a) the construction of a road, wall,*	South African Heritage Resource Agency	Act 25 of 1999

	power line, pipeline, canal or other similar form of linear development or barrier exceeding 300m in length; (b) the construction of a bridge or similar structure exceeding 50m in length; any development or other activity which will change the character of a site- must at the very earliest stages of initiating such a development inform the local resource authority of such development.		
Conservation of Agricultural Resources Act (Act 43 of 1983)	Regulation 15 has been promulgated that makes it unlawful to allow various species of weeds and invader plants to grow.	Department of Agriculture	Act 43 of 1983
The White Paper on the Energy Policy (Dec 1998)	The policy addresses most of the elements of the energy sector. Investments into renewable energy initiatives such as this proposed facility is supported by this White paper.		Dec 1998
The White Paper on Renewable Energy (Nov 2003)	Describes Government's vision, policy principles, strategic goals and objectives for promoting and implementing renewable energy in the Republic.	Department of Minerals and Energy	Nov 2003
National Veld and Forest Fires Act (Act 101 of 1998)	In terms of S12 a landowner must ensure that there is a firebreak around the property that is long and wide enough to have a reasonable chance of stopping a fire from spreading, not cause erosion and be free of inflammable materials. S17 requires the landowner to have sufficient equipment, protective clothing and trained personnel to extinguish fires	Department of Agriculture, Forestry and Fisheries (DAFF)	Act 101 of 1998
Hazardous Substances Act (Act 15 of 1973)	The act regulates the control of substances that have the potential to cause injury, or ill health, or death due to their toxic, corrosive, irritant, strongly sensitising, or	Department of Health	

	inflammable nature, or the generation of pressure and for the control of certain electronic products. These substances are categorised either Group I, II, III, and IV.		
Development Facilitation Act (Act 67 of 1995)	Overall framework and required administrative structures for planning in South Africa.	Local Municipality	Act 67 of 1995
Subdivision of Agricultural Land Act)Act 70 of 1970)	Land subdivision requirements and procedures.	Department of Agriculture, Forestry and Fisheries (DAFF)	Act 70 of 1970
National Road Traffic Act (Act 93 of 1996)	Contains the rules and conditions for the transport of abnormal loads and vehicles on public roads and the procedures of application for exemption permits.	South African National Roads Agency ltd. Provincial Department of Transport	Act 93 of 1996
Northern Cape Nature Conservation Act (Act 9 of 2009)	The sustainable utilisation of wild animals, aquatic biota and plants, provides for the implementation of the Convention for the trade in endangered species of Wild fauna and Flora, offences and penalties in terms of the act, the appointment of nature conservators and the issuing of permits	Department of Environment and Nature Conservation.	

12. WASTE, EFFLUENT, EMISSION AND NOISE MANAGEMENT

a) Solid waste management

Will the activity produce solid construction waste during the construction/initiation phase?	YES√	NO
If YES, what estimated quantity will be produced per month?	<5m^3	

How will the construction solid waste be disposed of (describe)?

Primarily excess building materials, concrete and concrete spillage, metal and cabling off-cuts, packaging materials. This amount of waste would easily be handled by the construction team and / or transported to the municipal waste site or in an instance where the waste is non-recyclable then the nearest suitable / registered disposal facility.

Where will the construction solid waste be disposed of (describe)?

As indicated above, in an instance where the solid waste cannot be handled on site, then it will be trucked to the closest registered waste disposal facility.

Will the activity produce solid waste during its operational phase?	YES / NO√
If YES, what estimated quantity will be produced per month?	m^3

How will the solid waste be disposed of (describe)?

If the solid waste will be disposed of into a municipal waste stream, indicate which registered landfill site will be used.

Where will the solid waste be disposed of if it does not feed into a municipal waste stream (describe)?

If the solid waste (construction or operational phases) will not be disposed of in a registered landfill site or be taken up in a municipal waste stream, then the applicant should consult with the competent authority to determine whether it is necessary to change to an application for scoping and EIA.

Can any part of the solid waste be classified as hazardous in terms of the NEM:WA?	YES / NO√

If YES, inform the competent authority and request a change to an application for scoping and EIA. An application for a waste permit in terms of the NEM:WA must also be submitted with this application.

Is the activity that is being applied for a solid waste handling or treatment facility?	YES / NO√

If YES, then the applicant should consult with the competent authority to determine whether it is necessary to change to an application for scoping and EIA. An application for a waste permit in terms of the NEM:WA must also be submitted with this application.

b) Liquid effluent

Will the activity produce effluent, other than normal sewage, that will be disposed of in a municipal sewage system?	YES / NO√
If YES, what estimated quantity will be produced per month?	m^3
Will the activity produce any effluent that will be treated and/or disposed of on site?	YES / NO√

If YES, the applicant should consult with the competent authority to determine whether it is necessary to change to an application for scoping and EIA.

Will the activity produce effluent that will be treated and/or disposed of at another facility?	YES / NO√

If YES, provide the particulars of the facility:

Facility name:			
Contact person:			
Postal address:			
Postal code:			
Telephone:		Cell:	
E-mail:		Fax:	

Describe the measures that will be taken to ensure the optimal reuse or recycling of waste water, if any:

c) Emissions into the atmosphere

Will the activity release emissions into the atmosphere other that exhaust emissions and dust associated with construction phase activities?	YES	NO√
If YES, is it controlled by any legislation of any sphere of government?	YES	NO

If YES, the applicant must consult with the competent authority to determine whether it is necessary to change to an application for scoping and EIA.

If NO, describe the emissions in terms of type and concentration:

Once operational this is characterised as non-consumptive resource use, inputs are in the form of solar radiation from the sun which is converted to electricity with no waste or emissions.

d) Waste permit

Will any aspect of the activity produce waste that will require a waste permit in terms of the NEM:WA?	YES	NO√

If YES, please submit evidence that an application for a waste permit has been submitted to the competent authority

e) Generation of noise

Will the activity generate noise?	YES	NO√
If YES, is it controlled by any legislation of any sphere of government?	YES	NO

If YES, the applicant should consult with the competent authority to determine whether it is necessary to change to an application for scoping and EIA.

If NO, describe the noise in terms of type and level:

During the construction phase noise would be associated with typical construction site (construction machinery and noise associated with construction crews on site), this however would be of limited duration. In the operational phase maintenance and service crews would visit the site with insignificant levels of noise from vehicles moving along the array to clean and/or repair it.

13. WATER USE

Please indicate the source(s) of water that will be used for the activity by ticking the appropriate box(es):

Municipal√	Water board	Groundwater	River, stream, dam or lake	Other	The activity will not use water

If water is to be extracted from groundwater, river, stream, dam, lake or any other natural feature, please indicate the volume that will be extracted per month:		N/A
Does the activity require a water use authorisation (general authorisation or water use license) from the Department of Water Affairs?	YES	NO√

If YES, please provide proof that the application has been submitted to the Department of Water Affairs.

14. ENERGY EFFICIENCY

Describe the design measures, if any, that have been taken to ensure that the activity is energy efficient:

The proposed development is a net producer of energy. The technology for panel efficiency is advancing rapidly and energy efficiency will be improved by ensuring that the most efficient panels are installed.

Describe how alternative energy sources have been taken into account or been built into the design of the activity, if any:

PV Solar is an alternative source of energy generation thus this is not applicable.

SECTION B: SITE/AREA/PROPERTY DESCRIPTION

Important notes:

1. For linear activities (pipelines, etc) as well as activities that cover very large sites, it may be necessary to complete this section for each part of the site that has a significantly different environment. In such cases please complete copies of Section B and indicate the area, which is covered by each copy No. on the Site Plan.

Section B Copy No. (e.g. A): [ ]

2. Paragraphs 1 - 6 below must be completed for each alternative.

3. Has a specialist been consulted to assist with the completion of this section? YES√ NO

If YES, please complete the form entitled "Details of specialist and declaration of interest" for each specialist thus appointed and attach it in Appendix I. All specialist reports must be contained in Appendix D.

Property description/physical address:

Province	Northern Cape Province
District Municipality	Namaqua District Municipality
Local Municipality	Nama Khoi Municipality
Ward Number(s)	
Farm name and number	Melboskuil, Farm 132
Portion number	26
SG Code	C05300000000013200026

Where a large number of properties are involved (e.g. linear activities), please attach a full list to this application including the same information as indicated above.

Current land-use zoning as per local municipality IDP/records:

Agriculture 1

In instances where there is more than one current land-use zoning, please attach a list of current land use zonings that also indicate which portions each use pertains to, to this application.

Is a change of land-use or a consent use application required? YES√ NO

1. GRADIENT OF THE SITE

Indicate the general gradient of the site.

Alternative S1:

Flat	1:50 – 1:20	1:20 – 1:15	1:15 – 1:10	1:10 – 1:7,5	1:7,5 – 1:5	Steeper than 1:5

Alternative S2 (if any):

Flat	1:50 – 1:20	1:20 – 1:15	1:15 – 1:10	1:10 – 1:7,5	1:7,5 – 1:5	Steeper than 1:5

Alternative S3 (if any):

Flat	1:50 – 1:20	1:20 – 1:15	1:15 – 1:10	1:10 – 1:7,5	1:7,5 – 1:5	Steeper than 1:5

The development footprint will affect only a small portion of the total farm (approximately 20 ha). Elevation varies between 970 and 1,300 meters above sea level. There are several small and only ephemeral water courses on the farm that run out of the mountains. The main one drains in a southerly direction. The north eastern parts of the farm are less mountainous and the natural vegetation has been disturbed in parts of this. The solar development will be located in this area. It has a generally westerly aspect.

2. LOCATION IN LANDSCAPE

Indicate the landform(s) that best describes the site:

2.1 Ridgeline		2.4 Closed valley		2.7 Undulating plain / low hills	
2.2 Plateau	√	2.5 Open valley	√	2.8 Dune	
2.3 Side slope of hill/mountain	√	2.6 Plain		2.9 Seafront	

3. GROUNDWATER, SOIL AND GEOLOGICAL STABILITY OF THE SITE

Is the site(s) located on any of the following?

	Alternative S1:		Alternative S2 (if any):		Alternative S3 (if any):	
Shallow water table (less than 1.5m deep)	YES	NO√	YES	NO	YES	NO
Dolomite, sinkhole or doline areas	YES	NO√	YES	NO	YES	NO
Seasonally wet soils (often close to water bodies)	YES	NO√	YES	NO	YES	NO
Unstable rocky slopes or steep slopes with loose soil	YES	NO√	YES	NO	YES	NO
Dispersive soils (soils that dissolve in water)	YES	NO√	YES	NO	YES	NO
Soils with high clay content (clay fraction more than 40%)	YES	NO√	YES	NO	YES	NO
Any other unstable soil or geological feature	YES	NO√	YES	NO	YES	NO
An area sensitive to erosion	YES	NO√	YES	NO	YES	NO

Description:

There are two different land types across the farm. The land type over most of the farm is Ib127 where rock outcrops dominate, interspersed with very shallow soils on underlying rock. Land type Ae80 is in that part of the farm where the solar development will be located. In this land type there are deeper red, sandy soils interspersed with the similar shallow soils of the other land type. The soils on the farm have low erodibility, but because of the steep slopes there is still a reasonable erosion risk (class 5 and 6 erosion hazard). The proposed layout however will avoid these steep slopes.

If you are unsure about any of the above or if you are concerned that any of the above aspects may be an issue of concern in the application, an appropriate specialist should be appointed to assist in the completion of this section. Information in respect of the above will often be available as part of the project information or at the planning sections of local authorities. Where it exists, the 1:50 000 scale Regional Geotechnical Maps prepared by the Council for Geo Science may also be consulted.

4. GROUNDCOVER

Indicate the types of groundcover present on the site. The location of all identified rare or endangered species or other elements should be accurately indicated on the site plan(s).

Natural veld - good condition^{E}	√ Natural veld with scattered aliens^{E}	Natural veld with heavy alien infestation^{E}	Veld dominated by alien species^{E}	Gardens
Sport field	√ Cultivated land	Paved surface	Building or other structure	√ Bare soil

If any of the boxes marked with an "^{E} "is ticked, please consult an appropriate specialist to assist in the completion of this section if the environmental assessment practitioner doesn't have the necessary expertise.

Please refer to Appendix D – Specialist Reports

5. SURFACE WATER

Indicate the surface water present on and or adjacent to the site and alternative sites?

Perennial River	YES	NO√	UNSURE
Non-Perennial River	YES√	NO	UNSURE
Permanent Wetland	YES	NO√	UNSURE
Seasonal Wetland	YES	NO√	UNSURE
Artificial Wetland	YES	NO√	UNSURE
Estuarine / Lagoonal wetland	YES	NO√	UNSURE

If any of the boxes marked YES or UNSURE is ticked, please provide a description of the relevant watercourse.

There are two non perennial drainage lines that run within and adjacent to the areas being considered for the proposed development. The sensitivity of this feature will be taken into account and impacts avoided through the retention of buffer areas to a distance of 32m from the highest point of the bank of the drainage line.

6. LAND USE CHARACTER OF SURROUNDING AREA

Indicate land uses and/or prominent features that currently occur within a 500m radius of the site and give description of how this influences the application or may be impacted upon by the application:

Natural area✓	Dam or reservoir	Polo fields
Low density residential✓	Hospital/medical centre	Filling station [H]
Medium density residential	School	Landfill or waste treatment site
High density residential	Tertiary education facility	Plantation
Informal residential[A]	Church	Agriculture✓
Retail commercial & warehousing	Old age home	River, stream or wetland✓
Light industrial	Sewage treatment plant[A]	Nature conservation area✓
Medium industrial [AN]	Train station or shunting yard [N]	Mountain, koppie or ridge✓
Heavy industrial [AN]	Railway line [N]	Museum
Power station	Major road (4 lanes or more) [N]	Historical building
Office/consulting room	Airport [N]	Protected Area✓
Military or police base/station/compound	Harbour	Graveyard
Spoil heap or slimes dam[A]✓	Sport facilities	Archaeological site
Quarry, sand or borrow pit✓	Golf course	Other land uses (describe)

If any of the boxes marked with an "[N] "are ticked, how will this impact / be impacted upon by the proposed activity?

N/A

If any of the boxes marked with an "[An]" are ticked, how will this impact / be impacted upon by the proposed activity? Specify and explain:

N/A

If any of the boxes marked with an "[H]" are ticked, how will this impact / be impacted upon by the proposed activity? Specify and explain:

N/A

Does the proposed site (including any alternative sites) fall within any of the following:

Critical Biodiversity Area (as per provincial conservation plan)	YES	NO✓
Core area of a protected area?	YES	NO✓

Buffer area of a protected area?	YES	NO√
Planned expansion area of an existing protected area?	YES	NO√
Existing offset area associated with a previous Environmental Authorisation?	YES	NO√
Buffer area of the SKA?	YES	NO√

If the answer to any of these questions was YES, a map indicating the affected area must be included in Appendix A.

7. CULTURAL/HISTORICAL FEATURES

Are there any signs of culturally or historically significant elements, as defined in section 2 of the National Heritage Resources Act, 1999, (Act No. 25 of 1999), including Archaeological or paleontological sites, on or close (within 20m) to the site? If YES, explain:	YES	NO√
	Uncertain	
N/A		

If uncertain, conduct a specialist investigation by a recognised specialist in the field (archaeology or palaeontology) to establish whether there is such a feature(s) present on or close to the site. Briefly explain the findings of the specialist:

N/A

Will any building or structure older than 60 years be affected in any way?	YES	NO√
Is it necessary to apply for a permit in terms of the National Heritage Resources Act, 1999 (Act 25 of 1999)?	YES	NO√

If YES, please provide proof that this permit application has been submitted to SAHRA or the relevant provincial authority.

8. SOCIO-ECONOMIC CHARACTER

a) Local Municipality

Please provide details on the socio-economic character of the local municipality in which the proposed site(s) are situated.

Level of unemployment:

Springbok, Nababeep, Okiep, Concordia and Carolusberg were all established as towns to house the people working on the mines. These towns had a total population of 30992 in 2011. The sectors of are general government (21.7%), community, social and personal services (17.3%), wholesale & retail trade, catering and accommodation (17.3%) and mining (16%). Seventy three percent (72.9%) of the population are of employable age (between 15 and 65) (Census 2001). Fourty seven percent (47% or 12269 persons) of the employable population are employed, whilst 9.3% (or 2428 persons) are unemployed and discouraged work-seekers. Fourty four percent (43.7% or 11408 persons) of the population is not economically active.

Economic profile of local municipality:

The Nama Khoi Municipality is divided into nine wards, 57.7% of the households within the

municipality fall within the poverty level which is both lower than the Namakwa District Municipality and the Provincial levels. 39.1% of the households earn a middle income salary which is higher than the district and provincial figure. 3.2% of the households earn a high income salary which is also above that of the district and provincial figures. The areas primary economies are tourism, mining and extensive agriculture.

Household income overall is low as 51% of the population earns R38 400 (maximum R3 200 per month) and less, whilst 33.4% earns between R 38 401 and R 153 600 (maximum R12 800 per month) and 9% earn more than R12 800 per month.

Level of education:

The Nama Khoi IDP makes no mention of the levels of education within the municipal area. The averages for the province derived from the Statistics SA Community Survey conducted in 2007 show that people 71.4% males and 70.9% females aged between 5-24 years of age are attending school. While there are no province specific data on the levels of education the Stats SA report goes further and notes "Over the period 1996 to 2001, there was a drop in percentage from 33,9% to 30,8%. Between 2001 and 2007 however, there has been a notable growth in some secondary schooling among persons aged 20 years and older (30,8% in 2001 to 40,1% in 2007). There is a significant decrease in the percentage of the population aged 20 years and older with no schooling since 1996. In 1996 those who had no schooling accounted for 19,3% and steadily decreased to 17,9% in 2001 and to 10,3% in 2007. In 2007, 9,1% of persons aged 20 years and above had completed higher education, against 8,4% in 2001 and 6,2% in 1996."

b) Socio-economic value of the activity

What is the expected capital value of the activity on completion?	±R 180 million	
What is the expected yearly income that will be generated by or as a result of the activity?	±R 38.3 million	
Will the activity contribute to service infrastructure?	YES√	NO
Is the activity a public amenity?	YES√	NO
How many new employment opportunities will be created in the development and construction phase of the activity/ies?	Construction: 200 jobs over 8 months	
What is the expected value of the employment opportunities during the development and construction phase?	±R9.6 million	
What percentage of this will accrue to previously disadvantaged individuals?	40-45% (R3.84 - R4.32 million)	
How many permanent new employment opportunities will be created during the operational phase of the activity?	20 direct jobs biannually for 20 years	
What is the expected current value of the employment opportunities during the first 10 years?	±R14 million	
What percentage of this will accrue to previously disadvantaged individuals?	56% (R7.8million)	

9. BIODIVERSITY

Please note: The Department may request specialist input/studies depending on the nature of the biodiversity occurring on the site and potential impact(s) of the proposed activity/ies. To assist with the

identification of the biodiversity occurring on site and the ecosystem status consult http://bgis.sanbi.org or BGIShelp@sanbi.org. Information is also available on compact disc (cd) from the Biodiversity-GIS Unit, Ph (021) 799 8698. This information may be updated from time to time and it is the applicant/ EAP's responsibility to ensure that the latest version is used. A map of the relevant biodiversity information (including an indication of the habitat conditions as per (b) below) and must be provided as an overlay map to the property/site plan as Appendix D to this report.

a) Indicate the applicable biodiversity planning categories of all areas on site and indicate the reason(s) provided in the biodiversity plan for the selection of the specific area as part of the specific category)

Systematic Biodiversity Planning Category				If CBA or ESA, indicate the reason(s) for its selection in biodiversity plan
Critical Biodiversity Area (CBA)	Ecological Support Area (ESA)	Other Natural Area (ONA) ✓	No Natural Area Remaining (NNR) ✓	The areas being considered for the development fall outside the CBA and ESA's identified in the sector plan.

b) Indicate and describe the habitat condition on site

Habitat Condition	Percentage of habitat condition class (adding up to 100%)	Description and additional Comments and Observations (including additional insight into condition, e.g. poor land management practises, presence of quarries, grazing, harvesting regimes etc).
Natural	0%	The proposed development can be accommodated without impacting on high sensitivity areas which in this instance are those areas with largely undisturbed soils (but may be subject to grazing); that have a high level of botanical diversity and plant cover (except where there is bare rock or very shallow soils); that are likely to support populations of plant or animal Species of Conservation Concern; that include all designated Critical Biodiversity Areas, and provide important ecological connectivity and habitat linkages. Most of the seasonal drainage lines are included within this category, as are most of the rocky outcrops.
Near Natural (includes areas with low to moderate level of alien invasive plants)	65%	These areas are partly disturbed (may have been previously cultivated or heavily grazed); have a moderate level of botanical diversity and plant cover; are unlikely to support significant populations of plant or animal Species of Conservation Concern; are not within designated Critical Biodiversity Areas, but may provide a fair degree of ecological connectivity. Medium sensitivity areas could be considered for development and present no significant constraints to the proposed development.
Degraded (includes areas	%	This category is included in the near natural areas as smaller portions of these areas are degraded

heavily invaded by alien plants)		
Transformed (includes cultivation, dams, urban, plantation, roads, etc)	35%	Former sandy areas historically transformed to agriculture. These areas have a low botanical diversity and plant cover; are unlikely to support significant populations of plant or animal Species of Conservation Concern; are not within designated Critical Biodiversity Areas; do not provide key ecological linkages. Low sensitivity areas are the most appropriate areas for development and present no significant constraints to the proposed development.

c) Complete the table to indicate:
   (i) the type of vegetation, including its ecosystem status, present on the site; and
   (ii) whether an aquatic ecosystem is present on site.

Terrestrial Ecosystems		Aquatic Ecosystems						
Ecosystem threat status as per the National Environmental Management: Biodiversity Act (Act No. 10 of 2004)	Critical	Wetland (including rivers, depressions, channelled and unchanneled wetlands, flats, seeps pans, and artificial wetlands)			Estuary		Coastline	
	Endangered							
	Vulnerable							
	Least Threatened √	YES	NO√	UNSURE	YES	NO√	YES	NO √

d) Please provide a description of the vegetation type and/or aquatic ecosystem present on site, including any important biodiversity features/information identified on site (e.g. threatened species and special habitats)

The SA Vegetation Map (Mucina & Rutherford 2006) indicates that two vegetation types occur in the study area – Namaqualand Klipkoppe Shrubland on the rocky parts, and Namaqualand Blomveld on the low gradient flats in the west (see Figure 4). Both vegetation types are regarded as Least Threatened on a national basis (DEA 2011). The Klipkoppe has about 95% of its original total extent still remaining, and about 6% is protected, whilst the Blomveld has a similar percentage remaining but only about 1% is protected (Rouget *et al* 2004). The Klipkoppe Shrubland is widespread in the Bitterfontein to Springbok region, and is characterised by rocky granite (or gneiss) hills, separated by sandy slopes and valleys, and often forms part of the escarpment. The Blomveld ranges from Steinkopf to Kliprand, and occurs mostly at the extreme eastern fringes of the Succulent Karoo, on the high plateau.

Three distinct habitats or plant communities occur within the study area (see Figure 4 – Specialist Ecological Study) - deeper sandy soils on the flats; shallow rocky soils, mostly on the hills; and the seasonal drainage lines in the valley bottoms and gulleys.

Sandy Flats

The sandy flats are restricted to two areas of about 56ha in the western part of the study area (Figure 4), and these are the areas that would have supported Namaqualand Blomveld.

Most of the sandy flats are heavily grazed, and about 60% have been previously cultivated (probably more than twenty years ago). The most southerly patch of this habitat was the site of a stock kraal, and is consequently very heavily grazed and trampled. The natural vegetation in most of this habitat is relatively species poor, and is dominated by pioneer and weedy species, some of which are unpalatable to livestock.

Overall open space in the previously disturbed parts of this habitat is as high as 70-80%, declining to about 50% in the areas not previously cultivated. The ecological conservation value of the previously cultivated and heavily grazed and trampled parts (about 80%) of this habitat is Low at a site and regional scale, and the less heavily disturbed areas (20%) have a Medium botanical conservation value.

No plant Species of Conservation Concern[2] (SCC) were recorded from within the sandy flats part of the study area, but SCC that may occur in this habitat are *Colchicum cruciatum* (Vulnerable; Raimondo *et al* 2009), which is restricted to the Springbok to Steinkopf area, *Gladiolus salteri* (Rare; from Springbok towards Aggeneys), *Moraea indecora* (Vulnerable; Nababeep to Goegab), *Oxalis exserta* (Rare; Concordia to Kamiesberg) and *Lachenalia concordiana* (Rare), which is more widespread. None of these are however likely to occur from within the more disturbed or heavily grazed parts of this habitat, and are thus unlikely to occur on site, nor within the development footprint.

Seasonal drainage lines

All the five drainage lines on site are seasonal, and hold surface water only for short periods after heavy rains, such as after thunderstorms, when erosive capacity may be high. The seasonal drainage lines in the western part of the site are less than 5m wide, with the actual channel usually being only about 1-2m wide. There are no dams on site, and there do not appear to be any springs.

Permeability on site is evidently high, and this, in concert with the relatively low rainfall, means that the drainage lines generally do not support a distinct flora, and many of the typical drainage areas species (such as *Acacia karoro, Salicornia*, etc) are missing. Indigenous plant species associated with the drainage lines include *Codon royenii, Zygophyllum foetidum, Scirpoides dioecus* and various annuals. No plant Species of Conservation Concern were recorded from within this habitat, and none are expected to occur, except possibly *Colchicum cruciatum* (Vulnerable).

In the layout however these areas have been avoided and buffered by 32m to either side of the drainage line.

Rocky Hills

This habitat occupies the bulk (about 80%) of the study area, and is characterised by extensive exposed bedrock granite (or gneiss), boulders of various sizes, and intervening sandy areas. The habitat was not extensively or exhaustively surveyed, as it is clearly unsuitable for the proposed development, due to the steep slopes and rocky ground. The proposed development will not be located within these areas.

[2] The Red List of South African Plants (Raimondo *et al* 2009) has assessed all plant species in South Africa, and all indigenous species are now technically Red Listed or Red Data Book species, and thus it is preferable to use the term Species of Conservation Concern to refer to species that are listed as either Threatened or Rare.

SECTION C: PUBLIC PARTICIPATION

1. ADVERTISEMENT AND NOTICE

Publication name	Ons Kontrei	
Date published	08 February 2014	
Site notice position	Latitude	Longitude
Date placed		

Include proof of the placement of the relevant advertisements and notices in Appendix E1.

2. DETERMINATION OF APPROPRIATE MEASURES

Provide details of the measures taken to include all potential I&APs as required by Regulation 54(2)(e) and 54(7) of GN R.543.

Key stakeholders (other than organs of state) identified in terms of Regulation 54(2)(b) of GN R.543:

Title, Name and Surname	Affiliation/ key stakeholder status	Contact details (tel number or e-mail address)
Refer to Appendix E: Public Participation for current status.	The full database will be included in the Public participation report which will accompany the Final Basic Assessment Report	

Include proof that the key stakeholder received written notification of the proposed activities as Appendix E2. This proof may include any of the following:

- e-mail delivery reports;
- registered mail receipts;
- courier waybills;
- signed acknowledgements of receipt; and/or
- or any other proof as agreed upon by the competent authority.

3. ISSUES RAISED BY INTERESTED AND AFFECTED PARTIES

Summary of main issues raised by I&APs	Summary of response from EAP
Refer to Appendix E: Public Participation for current status.	The full database will be included in the Public participation report which will accompany the Final Basic Assessment Report

4. COMMENTS AND RESPONSE REPORT

The practitioner must record all comments received from I&APs and respond to each comment before the Draft BAR is submitted. The comments and responses must be captured in a comments and response report as prescribed in the EIA regulations and be attached to the Final BAR as Appendix E3.

Refer to Appendix E: Public Participation for current status.

5. AUTHORITY PARTICIPATION

Authorities and organs of state identified as key stakeholders:

Title, Name and Surname	Affiliation/ key stakeholder status	Contact details (tel number or e-mail address)
Mr A Baartman	Nama-Khoi Municipality	PO Box 17 Springbok 8240 027 7188100 T
Ms M Brandt	Namakwa District Municipality	Private Bag X 20 Springbok 8240 027 7182000 T
Ms T Makaudi	Northern Cape Department of Environmental and Nature Conservation	90 Long street, Sasko Building, Kimberley, 8301 053 8077430 T, 053 8313530
Mr K Leask	ESKOM	PO Box 1091, Johannesburg 2000 011 800811 T
Ms M Marubini(Delegate of the Minister Act 70 of 1970)	National Department of Agriculture Forestry and Fisheries	Private Bag X120, Pretoria 0001 012 3197619 T
Mr T Buthelezi(AgriLand Liaison Officer)	National Department of Agriculture, Forestry and Fisheries	Private Bag X120, Pretoria 0001 012 3197634 T
Mr S Khumalo	NERSA	PO Box 40343 Arcadia 0007
Civil Society Ward Councilor- Carolusberg	(Nama-Khoi Municipality)	PO Box 17 Springbok 8240 027 7188100
- Mr Michael Van der Poll Conservation	Goegap Nature Reserve Northern Cape Department of Environmental and Nature	Private Bag X16 Springbok 8240 027 718 9906 T 027 718 9906 F
CEO	O'Kiep Copper Company	PO Box 17 Nababeep 8265 027 713 2239 T

		027 713 2202 F

Include proof that the Authorities and Organs of State received written notification of the proposed activities as appendix E4.

In the case of renewable energy projects, Eskom and the SKA Project Office must be included in the list of Organs of State.

6. CONSULTATION WITH OTHER STAKEHOLDERS

Note that, for any activities (linear or other) where deviation from the public participation requirements may be appropriate, the person conducting the public participation process may deviate from the requirements of that sub-regulation to the extent and in the manner as may be agreed to by the competent authority.

Proof of any such agreement must be provided, where applicable. Application for any deviation from the regulations relating to the public participation process must be submitted prior to the commencement of the public participation process.

A list of registered I&APs must be included as appendix E5.

Copies of any correspondence and minutes of any meetings held must be included in Appendix E6.

SECTION D: IMPACT ASSESSMENT

The assessment of impacts must adhere to the minimum requirements in the EIA Regulations, 2010, and should take applicable official guidelines into account. The issues raised by interested and affected parties should also be addressed in the assessment of impacts.

1. IMPACTS THAT MAY RESULT FROM THE PLANNING AND DESIGN, CONSTRUCTION, OPERATIONAL, DECOMMISSIONING AND CLOSURE PHASES AS WELL AS PROPOSED MANAGEMENT OF IDENTIFIED IMPACTS AND PROPOSED MITIGATION MEASURES

Provide a summary and anticipated significance of the potential direct, indirect and cumulative impacts that are likely to occur as a result of the planning and design phase, construction phase, operational phase, decommissioning and closure phase, including impacts relating to the choice of site/activity/technology alternatives as well as the mitigation measures that may eliminate or reduce the potential impacts listed. This impact assessment must be applied to all the identified alternatives to the activities identified in Section A(2) of this report.

NB: NO GO Alternative:

To pursue the no go option is not considered feasible. From an economic perspective this landuse option is aligned with international, national, provincial, local and fine scale forward planning - the intensive use of land for the generation of renewable energy does translate into the most economically sustainable landuse for this marginal agricultural locality. The opportunity cost weighs in favour of the proposed development due to the suitability of the site for the proposed development from a heritage and visual impact perspective, conservation status of the ecosystem type, low potential impact of the development where approx. 6.5% of the land surface of the property can supply enough additional income to make the development economically viable for the landowner. Furthermore the transformation of <20 ha's of primarily transformed and/or degraded habitat will not impair the quality of biodiversity pattern or process assets on the site. The area is economically active due to its suitability for the extensive grazing of small stock, however returns from this landuse are marginal at best in these arid ecosystems. Sustainable landuse options for people in this location are therefore very limited and in our consultation appear to be closely linked to the ability of a landowner to diversify the income streams into the property to attain a position where the property becomes a viable business.. Fundamentally it appears that it would be at odds with international commitments in terms of the use of renewable energy, the forward planning of National Government, the PSDF and DF, IDP. For these reasons the no-go alternative is considered unfeasible and would not result in any of the impacts assessed.

Furthermore not of the identified impacts would be applicable in a scenario where the No Go alternative is applicable. Impacts would include:

1. A lost opportunity for South Africa to supplement energy needs from renewable sources.
2. An inability for South Africa to reach its targets for Carbon emissions.
3. It would result in a loss of employment opportunities generated in all thre phases of the development
4. It would result in no social investment to support specific social and economic initiatives as identified.

Thus we consider the No Go alternative to have a net negative impact on the area and the region.

DESIGN, PLANNING AND CONTRUCTION PHASE : IMPACT SUMMARY **For the full Impact Assessment please refer to **APPENDIX F – Impacts Assessment*** **Variable**	**Variable elements**	**Result of change in variable**	**Without Mitigation**	**Mitigated**	**Positive / Negative**	**Mitigation Measures**
Agricultural Resources	Loss of Agricultural Landuse	Overall loss of agricultural landuse in the area	18	18	Neutral	None for the site itself as it is a physical barrier to alternative landuse for the duration of the production of renewable energy.
	Soil Erosion	Loss of topsoil through sheet and gulley erosion	6	3	Negative	Ensure clear demarcation of the proposed areas for construction. Locate the site in low sensitivity areas. Ensure regular road maintenance which would include immediately stabilizing unstable portions of access roads. Regular monitoring of the site for signs of sheet and gulley erosion would be the most effective litigator measure. In instance where accelerated levels of erosion are occurring, stabilizing these areas either with geo-textiles or with basket gabion structures could mitigate further soil loss. Minimizing disturbance of denuded areas. The avoidance of rocky and highly irregular areas as well as drainage lines could avoid and mitigate impacts on topsoil and geological features on the site.

	Loss of top soil	Loss of topsoil through sheet and gulley erosion	6	3	Negative	Clearly demarcate the development footprint, access roads, laydown areas and cement batch mixing areas, locate them in areas of low sensitivity. Strip and stockpile topsoil from all areas where the soil profile has been disturbed. Re-spread the topsoil once the activity has been concluded. Dispose of the sub-surface clay spoils from excavations if they cannot be covered with topsoil. Ensure regular road maintenance which would include immediately stabilizing unstable portions of access roads. Regular monitoring of the site for signs of sheet and gulley erosion would be the most effective mitigatory measure. In instance where accelerated levels of erosion are occurring, stabilizing these areas either with geo-textiles or with basket gabion structures could mitigate further soil loss. Minimizing disturbance of denuded areas.
Biological and Ecological	Loss of Natural and Near Natural Vegetation	The site would experience the loss off the vegetated buffer areas along the drainage lines, the loss of vegetative cover below and around the array, the disruption of the soil profile, the loss of topsoil through sheet and gulley erosion, the increase in sediment loads in the drainage lines. Alien invasive plants are well adapted to colonising disturbed areas and cumulatively could replace the current diversity of the site, altering the diversity	21	18	Negative	Clearly demarcate the development footprint, access roads, laydown areas and cement batch mixing areas, locate them in areas of low sensitivity. Ensure a 32m buffer is maintained to either side along drainage lines, ensure that ongoing monitoring detects accelerated levels of sheet and gulley erosion and that these sites are stabilised either by packing a covering of cut vegetation or using geo-textiles and / or basket gabions. Use

		and structure of the ecological community on the site.				areas that are already degraded and / or heavily impacted and identified as having low to medium sensitivity from an ecological perspective beginning with areas that have the lowest sensitivity
	Loss of Habitat and Faunal Mortality	The vegetation types, habitats and species that occupy these habitats will be impacted by the proposed development but due to the fact that the ecosystem types are both widespread and have well over 90% of their original extent still intact translates into a scenario where there is ample habitat available to migrate to or which can act as a source area for new colonisers should the facility be decommissioned, cumulative impact would therefore be low.	18	18	Neutral	Clearly demarcate the development footprint, access roads, laydown areas and cement batch mixing areas, locate them in areas of low sensitivity. Ensure a 32m buffer is maintained to either side along drainage lines, ensure that ongoing monitoring detects accelerated levels of sheet and gulley erosion and that these sites are stabilised either by packing a covering of cut vegetation or using geo-textiles and / or basket gabions. Use areas that are already degraded and / or heavily impacted and identified as having low to medium sensitivity from an ecological perspective beginning with areas that have the lowest sensitivity.
Socio-economic	Influx of skilled people	Impacts in this regard would relate to additional facilities being constructed within the Northern Cape and the migration of temporary staff to these new development sites.	9	12	Positive	Local people should received preferential employment cumulative impact from the influx of skilled labour would be positive through the skills transfer and gainful employment of local people and business.
	Influx of Unemployed People	additional numbers of unemployed people entering the area in search of employment and an increase in the unemployment rate for the local authority.	10	10	Neutral	If the mitigation measures were implemented and local people received preferential employment cumulative impact from the influx of skilled labour

						would be positive through the skills transfer and gainful employment of local people and business.
	Young women's social well-being improves through employment.	in this regard would relate to additional numbers of young women employed and an increase in the self esteem of these young women and elevated social status within the community.	6	9	Positive	Reserve a set number of jobs for young women. Facilitate mechanisms to enable women to access these employment opportunities. Ensure that equity in remuneration for men and women doing the same job. Ensure that young women gain equal access to training and education opportunities.
	Improved economic and material well being as the skills base of the local population expands and deepens.	This would relate to additional numbers of people having employable skills sets.	8	15	Positive	Reserve a set number of jobs for local labour. Facilitate mechanisms to enable these local people to access these employment opportunities. Enhance formal and informal skills transfer by implementing a training and skills development programme to enhance opportunities for local HDI's in the construction and maintenance sectors. This to be achieved through structured job shadowing and learnerships or in liaison with accredited Further Education and Training College / University of Technology. Basics skills could be tutored at school level in a joint venture between the developer and schools or skills training service providers. An access to education support service assisting future student should be considered i.e. bursaries, career and financial planning assistance with planning for studies.

						Investment in teacher training in particular mathematics, science and physical science. Invest in additional tutoring in these scarce subjects.
	Increased levels of crime	This relate to additional numbers of crime incidents committed.	9	6	Negative	Reduce crime on site appoint security staff who have fixed shifts over a full 24 hour period. Implement access control and document all vehicles and people entering and leaving the premises. Undertake regular searches of vehicles entering or leaving the premises. Bar entrance to people not concerned with the development. Limit the number of access points to a minimum.
	Local and regional contractors find employment over unskilled locals reducing community stability.	This relates to additional numbers of employment opportunities becoming available to skilled regional people and contractors.	12	15	Positive	Local HDI's with suitable skills should be preferentially employed. All opportunities should be formally communicated to the municipality, local community and local community organisations. A database of locally based firms, including SMME's owned and run by HDI's, who are able to supply the required services should be compiled by the developer prior to the release of the tender. The developer should assist local HDI services providers to complete and submit the tender documentation or appoint a service provider to do so. Establish a Monitoring Committee to oversee the implementation

						EMPr and interact in instances where problems are experienced.
	Changes in the living environment – health & safety	This relates to higher levels of accidents and greater demands on the service infrastructure of the local authority and reduced levels of health related to sexually transmitted disease.	6	3	Negative	Adhere to international construction health and safety standards and precaution measures. Provide health and training amongst the project team. Make sure that the construction team and their family meet regularly, at least once a month.
	Increase in traffic may cause changes in living environment.	This relate to the deterioration of the roads to levels where they could be life threatening to people, unsafe intersections for oncoming traffic on access routes, unsafe pedestrian crossings and increased pedestrian traffic which all may lead to increased accidents some of which may prove lethal.	10	8	Negative	Maintain all access roads throughout the project cycle. Upgrade road signs to address the increased traffic at intersections. Erect road signs and create pedestrian crossings. Where practical provide transport to reduce pedestrian traffic. Restrict heavy vehicles on access roads to specific hours of the day. Erect road signs and signals when heavy vehicles are working on site or travelling to the site.
	Increased demand for municipal services.	this regard would relate to transgressions of safety standards and precaution measures when transporting heavy loads and the potential for serious accidents. The absence of adequate training could be at the route of the problem and cumulatively could result in significant losses to the developer.	9	6	Negative	Adhere to national traffic safety standards and precaution measures. Provide traffic safety awareness amongst the project team and the community.
	Increased income into certain	Cumulative impacts would relate to the employment of people from outside over those who have the skills but are locally	9	9	Neutral	The developer and contractor should act as a reference for locals employed. The developer and contractor to liaise with

	households.	based. The positive impact of money flowing into local households would be lost.				existing and future projects to access employment for locals.
	Increased sales volumes locally and regionally.	If the mitigation measures were implemented then local skilled and unskilled people in small businesses would benefit as well as the local economy.	8	12	Positive	Contractors should be directed by tender requirements to purchase materials locally. The developer should leverage discount within the municipal area and employees should be made aware of these benefits. Small businesses should be supported. Joint ventures between small businesses and more established and experienced businesses should be encouraged.
	Increased noise and dust levels.	would relate to the dust and noise impacting on the inhabitants of Carolusberg due to a lack of dust suppression and noise impacts outside of normal working hours.	9	3	Negative	Mitigation Measures: Control dust and noise as prescribed in the EMPr. Appoint an independent ECO to monitor and implement the conditions of the EMPr. Undertake education and awareness training with the project team. Limit construction and traffic to the road reserve. Rehabilitate any natural areas post construction. Enforce strict operating hours for heavy vehicles and construction activities. Implement dust and noise suppression measures. Clearly demarcate access routes to the construction site. No littering should be allowed and all waste should be removed from the site. Keep cut and fill activities to a minimum and rehabilitate these areas immediately..
	Increased economic and	Cumulative impacts would relate to increased demand for products at local,	12	12	Neutral	None

	material well being – GGP related.	regional and national scales.				
Cultural and Historical	Loss of Cultural & Heritage Resources	Cumulative impacts resulting from the disturbance of the two sites identified would translate into a total loss of the resource	14	3	Negative	Fence off and avoid these sites – i.e. they should be regarded as no go areas with no access allowed.
Visual	Visual Impact on Sensitive Receptors in the Foreground & Middleground	Once the facility has been constructed it will remain stable in terms of the impact. The impact would therefore only have an additive visual impact directly after construction changing an agricultural view shed into one that is now used for energy generation.	14	12	Negative	Disturbed areas should be kept to a minimum. The development footprint should be clearly demarcated and no development outside of the footprint should be allowed. A rigorous planting regime on the western boundary of the project site should be instituted, include also the road reserve adjacent to the residential erven of Carolusberg. All plants used for should be indigenous refer to Appendix D – Specialist Reports (Visual). Buildings on site should keep within the planning policy in particular the principles of critical regionalism, namely sense of place, sense of history, sense of nature, sense of craft and sense of limits. Finally existing tracks and roads should be used in preference wherever possible.

	Visual Impact on the Intrinsic value and sense of place of the region	Once the facility has been constructed it will remain stable in terms of the impact. The impact would therefore only have an additive visual impact directly after construction changing an agricultural view shed into one that is now used for energy generation.	12	8	Negative	Disturbed areas should be kept to a minimum. The development footprint should be clearly demarcated and no development outside of the footprint should be allowed. A rigorous planting regime of indigenous species on the western boundary of the project site should be instituted, include also the road reserve adjacent to the residential erven of Carolusberg. All plants used for should be indigenous refer to Appendix D – Specialist Reports (Visual). Buildings on site should keep within the planning policy in particular the principles of critical regionalism, namely sense of place, sense of history, sense of nature, sense of craft and sense of limits. Finally existing tracks and roads should be used in preference wherever possible.
	Visual Impact of Artificial Lighting	Once the facility has been constructed it will remain stable in terms of the impact. The impact would therefore only have an additive visual impact directly after construction changing an agricultural view shed into one that is now used for energy generation and which will have security lights and building lights at night.	10	8	Negative	Outdoor lighting must be strictly controlled so as to prevent light pollution. All lighting must be installed at a downward angle. Sources of light must be shielded by physical barriers such as buildings, shrubs or trees. Where practical install motion detectors to provide light on demand. Affix the minimum wattage bulbs possible for each application.
	Visual Impact from Reflection and Glare	Once the facility has been constructed it will remain stable in terms of the impact. The impact would therefore only have an additive visual impact directly after	6	4	Negative	Consider the use of anti-reflective glass to reduce energy irradiation. Install electrical services underground whenever practically possible. Where pylons have to

	from the PV Array and Ancillary Buildings.	construction changing an agricultural view shed into one that is now used for energy generation and which will reflect light off the surface of the PV Array and the ancillary buildings.				be erected above ground ensure that h-Frame wooden pylons are used. Strictly orientate PV Panels in a Northerly direction to prevent possible reflection on sensitive receptors in the close vicinity of the project site.
	Visual Impact from Desertification of the Landscape.	If mitigatory measures were not instituted then cumulative erosion of the access roads and areas under the PV Array or around ancillary buildings may result.	24	10	Negative	Keep disturbed areas to a minimum. Limit the construction to below the 1080 contour line to decrease the potential for erosion. Remain within the demarcated development footprint. Re-introduce indigenous annuals and forbs through active seeding. Maintain road surfaces and construct storm water channels alongside access roads to divert storm water away off the road surface. Install rainwater tanks to collect rain water off all infrastructural surfaces. Install spreaders at the end of down pipes to break the kinetic energy of the water and prevent scouring of the land. Adhere to the recommendations of the ECO and the conditions of the EMPr.

Colour	Score	Rating
	0-20	Low
	20-30	Medium
	> 30	High

OPERATIONAL PHASE : IMPACT SUMMARY **For the full Impact Assessment please refer to **APPENDIX F – Impacts Assessment***						
Variable	Variable elements	Result of change in variable	Without Mitigation	Mitigated	Positive / Negative	Mitigation Measures
Geographical and Physical	Loss of top soil	If poorly managed impacts cumulative impacts could result in the increase of the width of access roads, sheet and gulley erosion which over time could conceivably extend over a greater area and cause more significant impacts. This is concomitant with the loss of topsoil and the loss of soils fertility.	10	5	Negative	Clearly demarcate the development footprint, access roads, laydown areas and cement batch mixing areas, locate them in areas of low sensitivity. Avoid soil disturbance by strictly controlling vehicles using the access roads for maintenance and repairs to ensure that new roads are not created over time, ensure regular road maintenance to ensure that the driving surface remains in good order to ensure that the need to drive along an alternative route is avoided. Monitor the entire area and if unnaturally high levels of sheet or the formation of gulley's is detected then these should be stabilised with geo-textiles or through the use of basket gabions.
Biological and Ecological	Loss of Local to Regional Connectivity (Vegetation)	With over 90% of these ecosystems remaining in an intact state and with the wide distribution and range cumulative impacts at a regional scale or at the scale of the ecosystem itself would be low. At a local scale if no mitigatory measures were instituted connectivity could be completely lost due to the transformation of the site as a whole.	21	21	Neutral	No mitigatory measures at regional scales are possible other than the retention of the CBA and ecological support areas through the avoidance of unsuitable landuse in those areas. Clearly demarcate the development footprint, access roads, laydown areas and cement batch mixing areas, locate them in areas of low sensitivity. At a local scale the avoidance of sensitive areas and the buffering of the drainage lines to retain connectivity through the site is a mitigatory measure. The species richness in the surrounding vegetation has been negatively

						impacted by overgrazing in the past, the removal of small stock would allow for the reseeding densities to improve, the disturbance regime however would be required to ensure that the vegetation would not senesce, and die off.
	Loss of Local to Regional Connectivity (Faunal Implications)	With over 90% of these ecosystems remaining in an intact state and with the wide distribution and range cumulative impacts at a regional scale or at the scale of the ecosystem itself would be low. At a local scale if no mitigatory measures were instituted connectivity could be completely lost due to the transformation of the site as a whole.	10	10	Neutral	No mitigatory measures at regional scales are possible other than the retention of the CBA and ecological support areas through the avoidance of unsuitable landuse in those areas through appropriate decision making which falls outside the scope of this assessment and responsibility of the proponent. Clearly demarcate the development footprint, access roads, laydown areas and cement batch mixing areas, locate them in areas of low sensitivity. At a local scale the avoidance of sensitive areas and the buffering of the drainage lines to retain connectivity through the site is a mitigatory measure. Additionally the security fence surrounding the proposed site should be permeable to smaller terrestrial species such as tortoises and lizards, avoid solid cement walls or walls with a concrete base that protrudes above ground level. When laying on services in trenches, these should

						not remain open for longer than three days as they will trap smaller terrestrial species. These trenches should be checked prior to filling and trapped species should be removed. The species richness in the surrounding vegetation has been negatively impacted by overgrazing in the past, the removal of small stock would allow for the reseeding densities to improve, the disturbance regime however would be required to ensure that the vegetation would not senesce, and die off.
	Colonisation by Alien Invasive Species	If left uncontrolled cumulatively these species may be able to invade ever larger areas on the site, the potential for more invasive species colonising the site would result in significant impacts on indigenous species complexes and populations through physical replacement.	14	3	Negative	Eradicate all alien invasive species as soon as they are detected on site.
	Avian Collision with the Proposed Power line	– Due to the fact that the line is so short (3km) it is not expected that the impacts will be high cumulatively.	12	12	Neutral	In this instance due to the low rating for the proposed and its adjacency to a populated area no mitigation measures are recommended

Socio-economic	Increase in skills levels	This relates to additional skills development for people outside of the community and the loss of those skills to the local and regional area.	8	18	Positive	Ensure that local benefit from an on the job training programme. Facilitate mechanisms for local unemployed people to access skills training opportunities. Expand the focus of training opportunities to include formal training.
	Influx of Unemployed People	This relates to additional numbers of unemployed people entering the area in search of employment and an increase in the unemployment rate for the local authority. Thus potentially an increase on social services and an increase in the crime rate.	10	10	Neutral	If mitigation measures were implemented and local people received preferential employment cumulative impact from the influx of skilled labour would be positive through the skills transfer and gainful employment of local people and business.
	Young women's social well-being improves through employment.	This relates to additional numbers of young women employed and an increase in the self esteem of these young women and elevated social status within the community.	6	9	Positive	Reserve a set number of jobs for young women. Facilitate mechanisms to enable women to access these employment opportunities. Ensure that equity in remuneration for men and women doing the same job. Ensure that young women gain equal access to training and education opportunities.
	Community perceptions of young women changes.	This relates to the inability of young women to enter into skills development and educational opportunities and the subsequent impacts on the social well being of the family.	6	18	Positive	Reserve a set number of study opportunities for young women. Facilitate mechanisms to enable women to access these employment for the skills they have obtained. Facilitate further study opportunities. Ensure that equity in opportunities for men and women in terms of skills development and employment opportunities.

	Improved economic and material well being – Local job creation	This relates to additional numbers of people having employable skills sets.	12	14	Positive	Contractors employing or seeking to employ local HDI's should receive preference. The municipality, local community and local community organisations should be informed and communicate potential job opportunities to job seekers. The developer should assist local HDI's to complete and submit tender documents. Skills transfer and development should be implemented and should run in parallel with opportunities for more formalised training by service providers.
	Intergenerational change due to access to education in scarce subjects.	Relates to diminished numbers of student entering and completing education in scarce subjects.	15	18	Positive	Facilitate mechanisms to enable young people to access the educational opportunities and attend courses in scarce subjects. Make provision for formal and informal education. Once successfully completed these courses should lead to further opportunities for higher education
	Growth in Tourism.	Relates to an opportunity for the generation of tourist revenue from the viewing of guiding of tourists around facilities such as this but because they are not actively marketed the impact is not realised.	8	12	Positive	Market the solar facility as a tourist destination. Create links with other tourism activities in Springbok through local web base channels, organisation, information bureaus or societies.
	Increase in small businesses.	Cumulative Impacts in this regard would relate to the lack of support to local small business and an inability of some small business owners to establish and run a business	8	15	Positive	Promote joint venture between small business and more established business. Implement a formal business training and mentoring programme.

	Increased income into certain households.	relate to the employment of people from outside over those who have the skills but are locally based. The positive impact of money flowing into local households would be lost.	9	9	Neutral	The developer and contractor should act as a reference for locals employed. The developer and contractor to liaise with existing and future projects to access employment for locals.
	Increased sales volumes locally and regionally.	Increased sales volumes locally and regionally.	8	21	Positive	Contractors should be directed by tender requirements to purchase materials locally. The developer should leverage discount within the municipal area and employees should be made aware of these benefits. Small businesses should be supported. Joint ventures between small businesses and more established and experienced businesses should be encouraged.
	Increased economic and material well being – GGP related.	Cumulative impacts would relate to increased electricity availability at local, regional and national scales.	12	14	Positive	None
Cultural and Historical	Loss of Cultural & Heritage Resources	Cumulative impacts resulting from the disturbance of the two sites identified would translate into a total loss of the resource.	14	3	Negative	Fence off and avoid these sites – i.e. they should be regarded as no go areas with no access allowed.
Visual	Visual Impact on Sensitive Receptors in the Foreground & Middle ground	Once the facility has been constructed it will remain stable in terms of the impact. The impact would therefore only have an additive visual impact directly after construction changing an agricultural view shed into one that is now used for energy generation.	14	12	Negative	Disturbed areas should be kept to a minimum. The development footprint should be clearly demarcated and no development outside of the footprint should be allowed. A rigorous planting regime on the western boundary of the project site should be instituted, include also the road reserve adjacent to the residential erven of Carolusberg. All plants used for should be

						indigenous refer to Appendix D – Specialist Reports (Visual). Buildings on site should keep within the planning policy in particular the principles of critical regionalism, namely sense of place, sense of history, sense of nature, sense of craft and sense of limits. Finally existing tracks and roads should be used in preference wherever possible.
	Visual Impact on the Intrinsic value and sense of place of the region	Once the facility has been constructed it will remain stable in terms of the impact. The impact would therefore only have an additive visual impact directly after construction changing an agricultural view shed into one that is now used for energy generation	12	8	Negative	Disturbed areas should be kept to a minimum. The development footprint should be clearly demarcated and no development outside of the footprint should be allowed. A rigorous planting regime of indigenous species on the western boundary of the project site should be instituted, include also the road reserve adjacent to the residential erven of Carolusberg. All plants used for should be indigenous refer to Appendix D – Specialist Reports (Visual). Buildings on site should keep within the planning policy in particular the principles of critical regionalism, namely sense of place, sense of history, sense of nature, sense of craft and sense of limits. Finally existing tracks and roads should be used in preference wherever possible.

	Visual Impact of Artificial Lighting	Once the facility has been constructed it will remain stable in terms of the impact. The impact would therefore only have an additive visual impact directly after construction changing an agricultural view shed into one that is now used for energy generation and which will have security lights and building lights at night.	10	8	Negative	Outdoor lighting must be strictly controlled so as to prevent light pollution. All lighting must be installed at a downward angle. Sources of light must be shielded by physical barriers such as buildings, shrubs or trees. Where practical install motion detectors to provide light on demand. Affix the minimum wattage bulbs possible for each application
	Visual Impact from Reflection and Glare from the PV Array and Ancillary Buildings.	Once the facility has been constructed it will remain stable in terms of the impact. The impact would therefore only have an additive visual impact directly after construction changing an agricultural view shed into one that is now used for energy generation and which will reflect light off the surface of the PV Array and the ancillary buildings.	6	4	Negative	Consider the use of anti-reflective glass to reduce energy irradiation. Install electrical services underground whenever practically possible. Where pylons have to be erected above ground ensure that h-Frame wooden pylons are used. Strictly orientate PV Panels in a Northerly direction to prevent possible reflection on sensitive receptors in the close vicinity of the project site.
	Visual Impact from Desertification of the Landscape.	If mitigatory measures were not instituted then cumulative erosion of the access roads and areas under the PV Array or around ancillary buildings may result.	24	10	Negative	: Keep disturbed areas to a minimum. Limit the construction to below the 1080 contour line to decrease the potential for erosion. Remain within the demarcated development footprint. Re-introduce indigenous annuals and forbs through active seeding. Maintain road surfaces and construct storm water channels alongside access roads to divert storm water away off the road surface. Install

						rainwater tanks to collect rain water off all infrastructural surfaces. Install spreaders at the end of down pipes to break the kinetic energy of the water and prevent scouring of the land. Adhere to the recommendations of the ECO and the conditions of the EMPr.

Colour	Score	Rating
	0-20	Low
	20-30	Medium
	> 30	High

DECOMMISIONING PHASE : IMPACT SUMMARY **For the full Impact Assessment please refer to **APPENDIX F – Impacts Assessment***						
Variable	Variable elements	Result of change in variable	Without Mitigation	Mitigated	Positive / Negative	Mitigation Measures
Geographical and Physical	Restoration of Natural Vegetation to Stabilise the Soil Profile	If no mitigatory interventions were undertaken on sites such as these cumulatively numerous developments like this over a regional scale could result in the significant denuding of the landscape if these facilities were to be decommissioned. The bare soil surface would be prone to sheet erosion and the loss of topsoil from wind and rain events.	21	18	Negative	Once all infrastructure has been removed, the area beneath the panels must be ripped to a maximum depth of 10cm along the contour lines. The area can be actively reseeded with annual forbes prior to the onset of the winter rains. The area should remain fenced off and all stock should be removed for a period of no less than three years to allow the rehabilitation of the site. Thereafter the fences may be removed if desirable. Electrical cabling and services should be left intact below the ground if practically possible as their removal would result in additional impact. If the cables are to be dug up and removed then the trench should be unfilled immediately.
Biological and Ecological	Restoration of Natural Vegetation (Biodiversity restored to near natural state)	If no mitigatory interventions were undertaken on sites such as these cumulatively numerous developments like this over a regional scale could result in the significant denuding of the landscape if these facilities were to be decommissioned. The bare soil surface would be prone	21	21	Neutral	Once all infrastructure has been removed, the area beneath the panels must be ripped to a maximum depth of 10cm along the contour lines. The area can be actively reseeded with annual forbes prior to the onset of the winter rains. The area should remain fenced off and all stock should be removed for a period of no less than three years to allow the rehabilitation of the site. Thereafter the fences may be removed if desirable. Electrical cabling and services should be left intact below the ground if practically possible as their removal would result in additional impact. If the cables are to be dug up and removed then the trench

		to sheet erosion and the loss of topsoil from wind and rain events.				should be unfilled immediately.
Socio-economic	Influx of Skilled People	Cumulative Impacts in this regard would relate to additional facilities being constructed within the Northern Cape and the migration of temporary staff to these new development sites.	12	8	Negative	Preference to local HDI's who are suitably qualified. The developer should assist the local HDI to submit and complete tender forms on condition that local labour is used. Establish a Monitoring Committee constituted from the developer and representatives of the local community. The monitoring committee should ensure that the conditions of the EMPr are implemented.
	Influx of Unemployed People	This would relate to additional numbers of unemployed people entering the area in search of employment and an increase in the unemployment rate for the local authority. Thus potentially an increase on social services and an increase in the crime rate.	10	10	Negative	None
	Changes in economic and material well being of those who obtained skills.	This would relate to the inability of locals to take advantage of job opportunities and skills development training.	8	12	Negative	Reserve a certain number of employment opportunities for locals. Facilitate mechanisms to enable locals to access formal learning opportunities during the decommissioning phase.

	Increased income into certain households.	This relates to the employment of people from outside over those who have the skills but are locally based. The positive impact of money flowing into local households would be lost.	9	15	Negative	The developer and contractor should act as a reference for locals employed. The developer and contractor to liaise with existing and future projects to access employment for locals.
	Retrenchments	This relates to the employment of people from outside over those who have the skills but are locally based. The positive impact of money flowing into local households would be lost.	21	18	Negative	The developer and contractor should act as a reference for locals employed. The developer and contractor to liaise with existing and future projects to access employment for locals.
	Increased demand for municipal services.	This relates relate to transgressions of safety standards and precaution measures when transporting heavy loads and the potential for serious accidents. The absence of adequate training could be at the route of the problem and cumulatively could result in significant losses to the developer.	6	3	Negaitve	Adhere to national traffic safety standards and precaution measures. Provide traffic safety awareness amongst the project team and the community.
Cultural and Historical	Loss of Cultural & Heritage Resources	Cumulative impacts resulting from the disturbance of the two sites identified would translate	14	3	Negative	Fence off and avoid these sites – i.e. they should be regarded as no go areas with no access allowed.

		into a total loss of the resource.				
Visual	Visual Impact	This would relate to a much slower regeneration time and the potential for the loss of fertility due to topsoil being eroded from the site, lack of active reseeding interventions, lack of preparation of the soil i.e. ripping it to a maximum depth of 10cm.	12	21		Once all infrastructure has been removed, the area beneath the panels must be ripped to a maximum depth of 10cm along the contour lines. The area can be actively reseeded with annual forbes prior to the onset of the winter rains. The area should remain fenced off and all stock should be removed for a period of no less than three years to allow the rehabilitation of the site. Thereafter the fences may be removed if desirable. Electrical cabling and services should be left intact below the ground if practically possible as their removal would result in additional impact. If the cables are to be dug up and removed then the trench should be unfilled immediately.

Color	Score	Rating
	0-20	Low
	20-30	Medium
	> 30	High

A complete impact assessment in terms of Regulation 22(2)(i) of GN R.543 must be included as Appendix F.

2. ENVIRONMENTAL IMPACT STATEMENT

Taking the assessment of potential impacts into account, please provide an environmental impact statement that summarises the impact that the proposed activity and its alternatives may have on the environment after the management and mitigation of impacts have been taken into account, with specific reference to types of impact, duration of impacts, likelihood of potential impacts actually occurring and the significance of impacts.

Alternative A (preferred alternative)

DESIGN, PLANNING AND CONSTRUCTION PHASE:

Impacts to the physical environment are primarily associated with the loss of agricultural resources through the displacement of the current agricultural landuse, soil erosion and the loss of soil fertility through the removal of topsoil. Impacts here ranger from high low to low and for those impact variables where mitigation is possible to very low. Impacts significance is therefore acceptable. No positive impacts were identified.

Impacts on biological and ecological resources will be medium at local scales when considering the loss of natural vegetation. The impact can be slightly mitigated through effective planning and buffering of the more sensitive portions of the site and as such we consider the impact to be reduced to a high low significance with mitigation. For the loss of habitat and associated faunal mortality the impact is considered to be high-Low significance without an option for mitigation as these habitats will be lost. These impacts are considered to be negative. A potential positive impact was identified through the removal of grazing pressure from the land, but as this is an agricultural business this is not practical to implement.

Negative socio economic impacts would include the influx of unemployment people with resultant potential for an increase in the crime rate. The proposed development could result in changes in the living environment through impacts on health and safety. For short periods of time impacts from increased levels of traffic on access routes would also be evident, this would be associated with increased noise and dust levels on site. The greater number of people could place increased demand on municipal services. These impacts are however all considered to be low to very low with mitigation and as such are considered to be acceptable.

Positive socio economic impacts would relate to an influx of skilled people. The preferential employment of young women an improvement in their social wellbeing. Through on the job training and more formal training the skills base of the people in the area should broaden and deepen. This can be further facilitated through joint ventures of local skilled HDI's with more experienced business. The proposed development should result in increased levels of sales locally and regionally for materials. Impacts range between low to high Low through appropriate mitigation.

Impacts on cultural and historical resources is considered to be low due to the very low significance signature of the site.

Visual Impacts relate to impacts on sensitive receptors in the foreground and middle ground and

while to potential impact in the foreground of the community of Carolusberg is considered to be high, with mitigation the impact can be reduced to a low significance. Impacts on the intrinsic value and sense for place are considered to be low as will the impact from artificial lighting, reflection/ glare from the array and ancillary buildings. The highest potential impact identified as a medium impact would be desertification of the site, but if mitigated as recommended this impact should remain low.

OPERATIONAL PHASE:

The only negative impact identified for the physical environment is the loss of topsoil and consequent loss of soil fertility. The impact is considered to have a low significance.

From a biological and ecological perspective the loss of local to regional connectivity is considered to have a medium impact that is unavoidable and which cannot be mitigated for the lifespan of the proposed development. The faunal impact implication of this loss of connectivity however is considered to be low. With disturbance the site has a low potential for invasion by alien invasive plants. The powerline is short and faunal impacts are considered to be low, no mitigation was recommended.

As for the construction phase negative impacts on the socio economic front would relate to the influx of unemployed people a incidental consequence of the proposed development which is impossible to mitigate.

Positive socio economic impacts of the proposed development include the influx of skilled people and the increase in skills levels, the improvement in the social wellbeing of young women, the improved status of these young women within the community, increased economic and material well being of those employed, access to educational and skills training opportunities, increase and diversification of the tourism offer for the area, increased and deepening of the local small business sector, increased sales volumes locally and regionally and improved GGP for the regional as a whole. The cost benefit of proceeding with the proposed development therefore weighs favourably on the side of an operational PV array. Impact ranges from low, through high low to medium in this respect and is considered to be favourable.

Cultural and historical impacts are insignificant if the minor mitigation measures are implemented.

Visual Impacts relate to impacts on sensitive receptors in the foreground and middle ground and while to potential impact in the foreground of the community of Carolusberg is considered to be low, with mitigation the impact can be reduced to a low significance. Impacts on the intrinsic value and sense for place are considered to be low as will the impact from artificial lighting, reflection/ glare from the array and ancillary buildings. The highest potential impact identified as a medium impact would be desertification of the site, but if mitigated as recommended this impact should remain low.

DECOMISSIONING PHASE:

While the impacts on the physical environment during the decommissioning phase would be restorative in nature the overall impact would remain negative for the purposes of this impact assessment due to the very slow regenerative processes in arid environments.

The same would be true for the restoration efforts of the natural vegetation on the site. Impacts would remain at medium levels due to the aridity, low levels of biomass per unit area and slow rate of biomass turnover.

The socio economic impacts of decommissioning a facility such as this would be negative through the migration of skilled people to other areas, pressure on those areas resulting from the influx of unemployed people, the loss of economic opportunity to those employed by the facility and or deriving income through service or material supplies to the facility. This would result directly from retrenchments. Social investment into the community would be lost with concomitant loss in the skills development and educational opportunities as well as the development and support of small business. Impacts range from low to medium in this regard.

No impacts on historical or cultural resources are evident.

Visual impact could be medium resulting from the bare ground becoming exposed below the array and the slow regeneration times of natural vegetation in arid environments such this.

IMPACT STATEMENT:

In our assessment of impacts the cost benefit of the development favours proceeding as the majority of impacts are low with a small number of medium impacts. Many of the impacts however may be mitigated successfully further diminishing the impact of negative impacts and enhancing the impact of the many socio economic impacts identified. Therefore we would recommend the approval of the proposed development with due regard to the mitigation measures stated in the impact assessment – APPENDIX F – Impact Assessment and the management guidelines in APPENDIX G – Environmental Management Programme.

Alternative B

N/A

Alternative C

N/A

No-go alternative (compulsory)

To pursue the no go option is not considered feasible. From an economic perspective this landuse option is aligned with international, national, provincial, local and fine scale forward planning - the intensive use of land for the generation of renewable energy does translate into the most economically sustainable landuse for this marginal agricultural locality. The opportunity cost weighs in favour of the proposed development due to the suitability of the site for the proposed development from a heritage and visual impact perspective, conservation status of the ecosystem type, low potential impact of the development where approx. 6.5% of the land surface of the property can supply enough additional income to make the development economically viable for the landowner. Furthermore the transformation of <20 ha's of primarily transformed and/or degraded habitat will not impair the quality of biodiversity pattern or process assets on the site. The area is economically active due to its suitability for the extensive grazing of small stock, however returns from this landuse are marginal at best in these arid ecosystems. Sustainable landuse options for people in this location are therefore very limited and in our consultation appear to be closely linked to the ability of a landowner to diversify the income streams into the property to attain a position where the property becomes a viable business.. Fundamentally it appears that it would be at odds with international commitments in terms of the use of renewable energy, the forward planning of National Government, the PSDF and DF, IDP. For these reasons the no-go alternative is considered unfeasible.

Furthermore not of the identified impacts would be applicable in a scenario where the No Go alternative is applicable. Impacts would include:

5. A lost opportunity for South Africa to supplement energy needs from renewable sources.
6. An inability for South Africa to reach its targets for Carbon emissions.
7. It would result in a loss of employment opportunities generated in all three phases of the development
8. It would result in no social investment to support specific social and economic initiatives as identified.

Thus we consider the No Go alternative to have a net negative impact on the area and the region.

SECTION E. RECOMMENDATION OF PRACTITIONER

Is the information contained in this report and the documentation attached hereto sufficient to make a decision in respect of the activity applied for (in the view of the environmental assessment practitioner)?	YES√	NO

If "NO", indicate the aspects that should be assessed further as part of a Scoping and EIA process before a decision can be made (list the aspects that require further assessment).

If "YES", please list any recommended conditions, including mitigation measures that should be considered for inclusion in any authorisation that may be granted by the competent authority in respect of the application.

The proposed PV Array for Melkboskuil is not faced with any insurmountable impacts form the suite of impact variables identified and assessed be they geographical and physical, biological and ecological, socio-economic, cultural and historical and visual.
As a sensitive variable the protection and retention of the soils profile is important as are the drainage lines and areas above the 1080m contour line. The site however is large enough to allow the proponent to avoid impacts on these areas i.e by placing the array below the 1080m contour line, outside of the required buffer areas around the drainage lines and preferentially in low and medium sensitivity areas from a biological and ecological perspective, please see APPENDIX A – Maps and APPENDIX C – Facility Illustration.
We recommend the following provisions for consideration:

1. All reasonable recommendations be they mitigation interventions detailed in the impact assessment portions and appendices of this report or the management recommendations contained in the Environmental Management Programme should be adhered to and fully implemented.

2. Any other permitting or licenses required must be obtained prior to the initiation of the activity.

3. Adherence to conditions of any other South African Resource Use legislation applicable to this development should be mandatory.

4. At all times avoidance of impact on areas outside of the development should be achieved through the adequate demarcations of no go areas and enforcement ensured through on site management action. At all times the aim should be to keep the developed area to the absolute minimum required.

5. Natural areas which unavoidably have been impacted by the proposed development should be immediately attended to and rehabilitated.

6. Early detection of environmental impact and deterioration is only possible through an ongoing monitoring effort and this should be instituted for the full duration from construction to decommissioning.

7. All steep and rocky areas should be avoided as they inherently are sites that could become areas prone to accelerated levels of erosion. If in the finer resolution survey such areas will be impacted ensure inputs and involvement of the ECO in planning, construction and

management of the site.

8. In terms of the avoidance of impacts from erosion time construction to coincide with the drier times of the year wherever practically possible.

9. The developer, contractors, sub-contractors and staff permanently employed on the site must be made aware of the provisions for the mitigation of impact and the conditions contained in the EMPr. The developer must collaborate with the appointed ECO to ensure that the required awareness raising and education is undertaken when and where appropriate.

10. Clearly articulated method statements for some of the provisions within the EMPr must be developed these to include e.g. waste treatment and disposal, storm water management etc.

11. In terms of the flow of socio economic benefit derived from the development – preferentially appoint or use local people or businesses and in particular young women. This includes access to training and educational opportunities as well as support to local small business.

12. Establish or align with a forum or community organisation with adequate representation across civil society and institutions to communicate opportunities in a transparent and robust manner.

13. An appropriately qualified Environmental Control Officer should be appointed by the proponent to ensure that the conditions of the EMP are fulfilled and that regular monitoring of the development is undertaken.

14. That the appointed ECO provide a final report to DEA on completion of the activity to report on adherence to the conditions of the Environmental Authorisation.

Is an EMPr attached?	YES√	NO

The EMPr must be attached as Appendix G.

The details of the EAP who compiled the BAR and the expertise of the EAP to perform the Basic Assessment process must be included as Appendix H.

If any specialist reports were used during the compilation of this BAR, please attach the declaration of interest for each specialist in Appendix I.

Any other information relevant to this application and not previously included must be attached in Appendix J.

Keith Sean Ranger

_____

NAME OF EAP

_____ _____

SIGNATURE OF EAP DATE

SECTION F: APPENDIXES

The following appendixes must be attached:

Appendix A: Maps

Appendix B: Photographs

Appendix C: Facility illustration(s)

Appendix D: Specialist reports (including terms of reference)

Appendix E: Public Participation

Appendix F: Impact Assessment

Appendix G: Environmental Management Programme (EMPr)

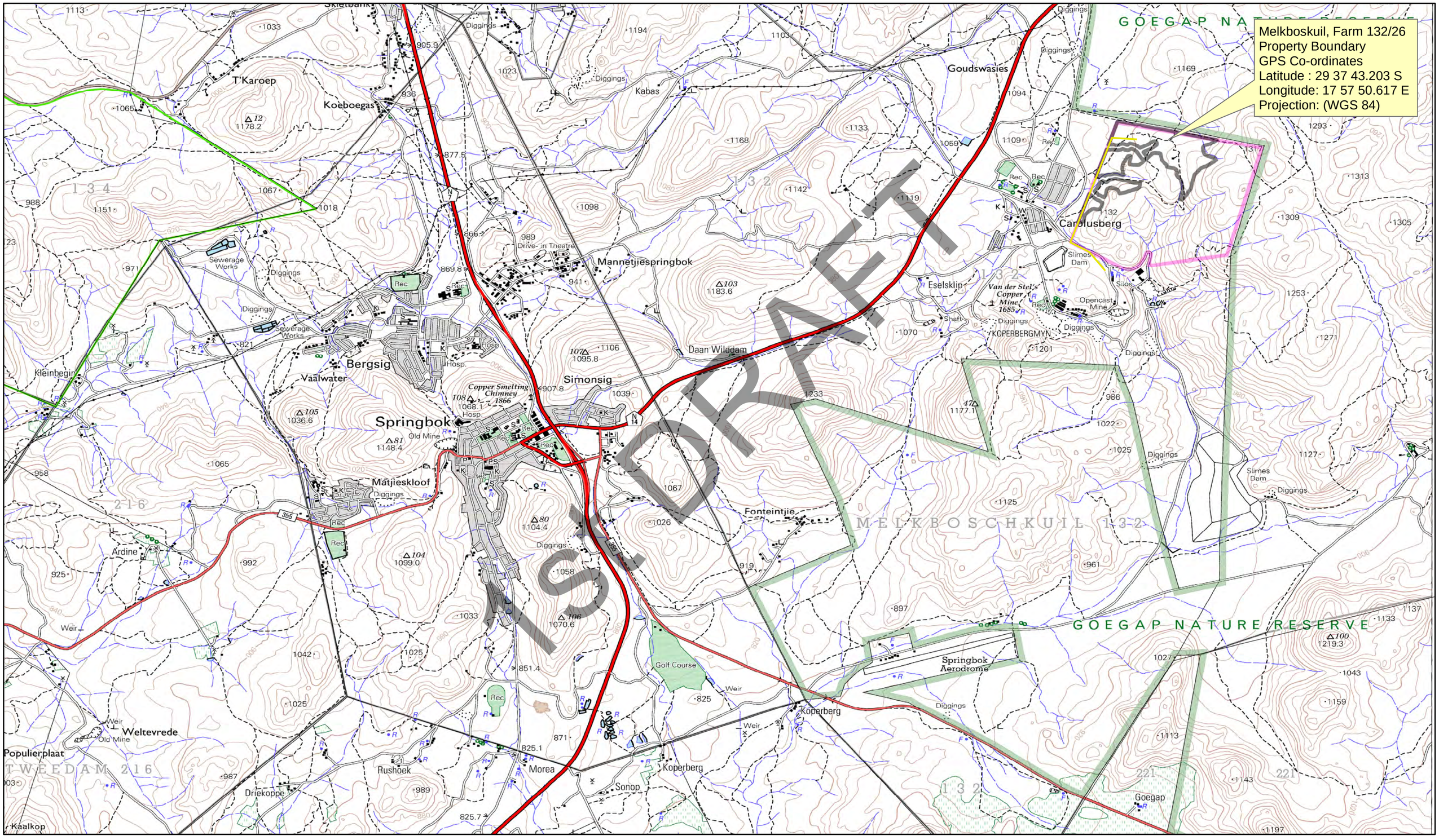
Appendix H: Details of EAP and expertise

Appendix I: Specialist's declaration of interest

Appendix J: Additional Information

APPENDIX A – LOCALITY MAP, LAYOUT, ROUTE PLAN & SENSITIVITY MAP

APPENDIX A1 - Locality Map - Proposed Solar PV, Farm 132/26, Melkboskuil, Carolusberg



Carolusberg, Farm 132/26 is located north-east of the town of Springbok to the east of the N14 and east of the settlement of Carolusberg.

APPENDIX A2 : Property Boundaries within 50m of Melkboskuil 132/26.

Farm 132/9
Boundary not availbale
from SG layer
Landuse : Residential area of Carolusberg
Zoning : Residential
Distance to residential Area >250m

Goega Nature Reserve comprised of:
Melkboschkuil - 132/3, 132/5 and 132/21
Goegap - 221/1
Karehoutkloof - 221/4
Green outline = Reserve Boundary
Landuse : Conservation
Zoning : Conservation

Melkboskuil 132/26
Proposed Area for Solar Array =
Blue

Melkboskuil 132/26
Pink outline = Property Boundary
Landuse : Extensive Agriculture
Zoning : Agriculture 1

Melkboskuil 132/42
Boundary not available
from SG layer
Landuse : Miining

Carolusberg
Slimes Dam
Silos
Opencast Mine
Eselsklip
Van der Stel's Copper Mine 1685
Shaft
Diggings
KOPERBERGMYN
Rec
1132
1169
1133
1059
1109
1142
1119
1313
1309
1253
1271
1070
1201
1233
1177.1
986
1080
1060
980

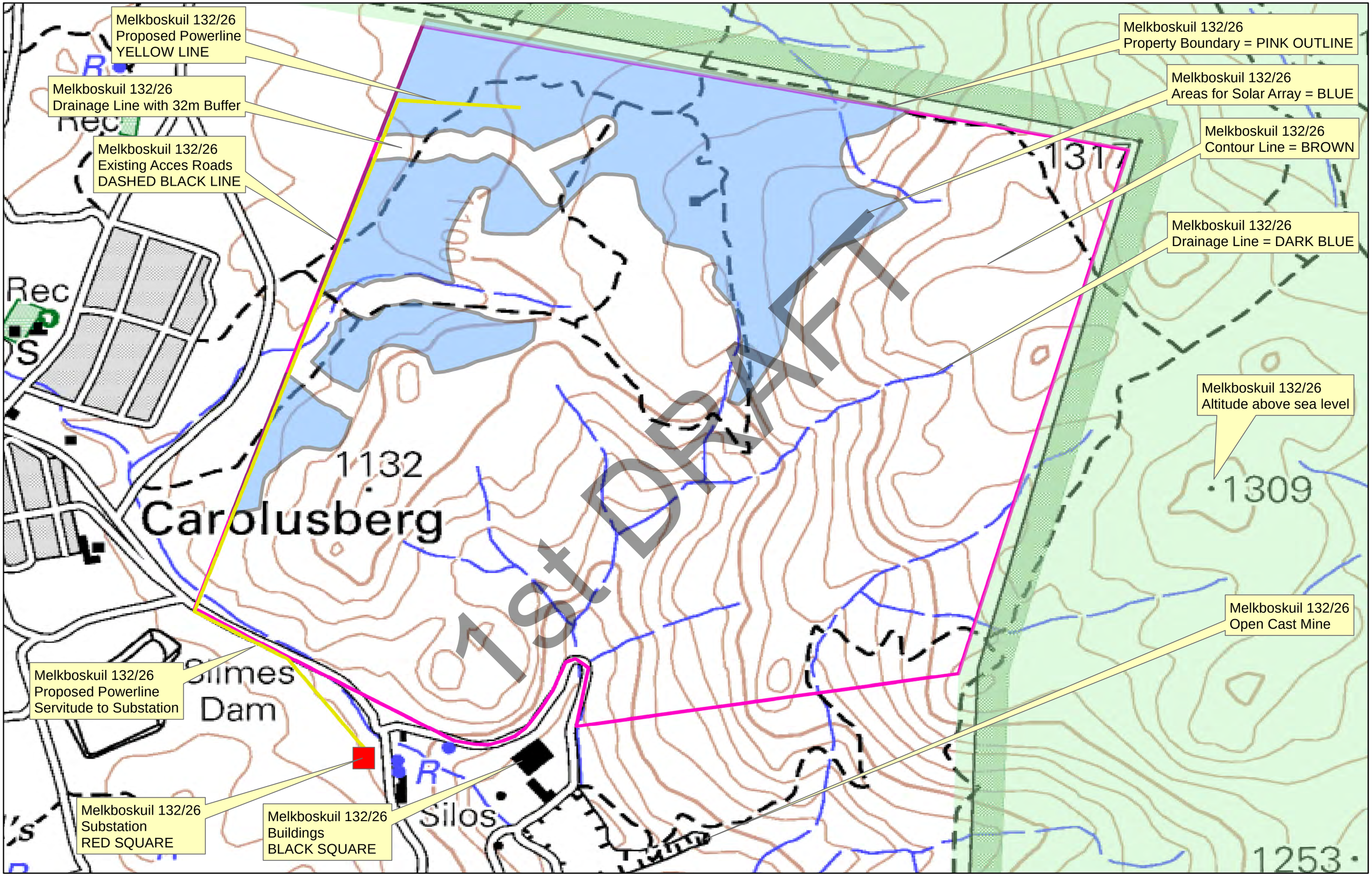
FOOTPRINT Environmental Services

Scale : 1 : 15 000

0 295 590 1 180 1 770 2 360 Meters

N W E S

APPENDIX A3 : Site Plan - Melkboskuil 132/26.

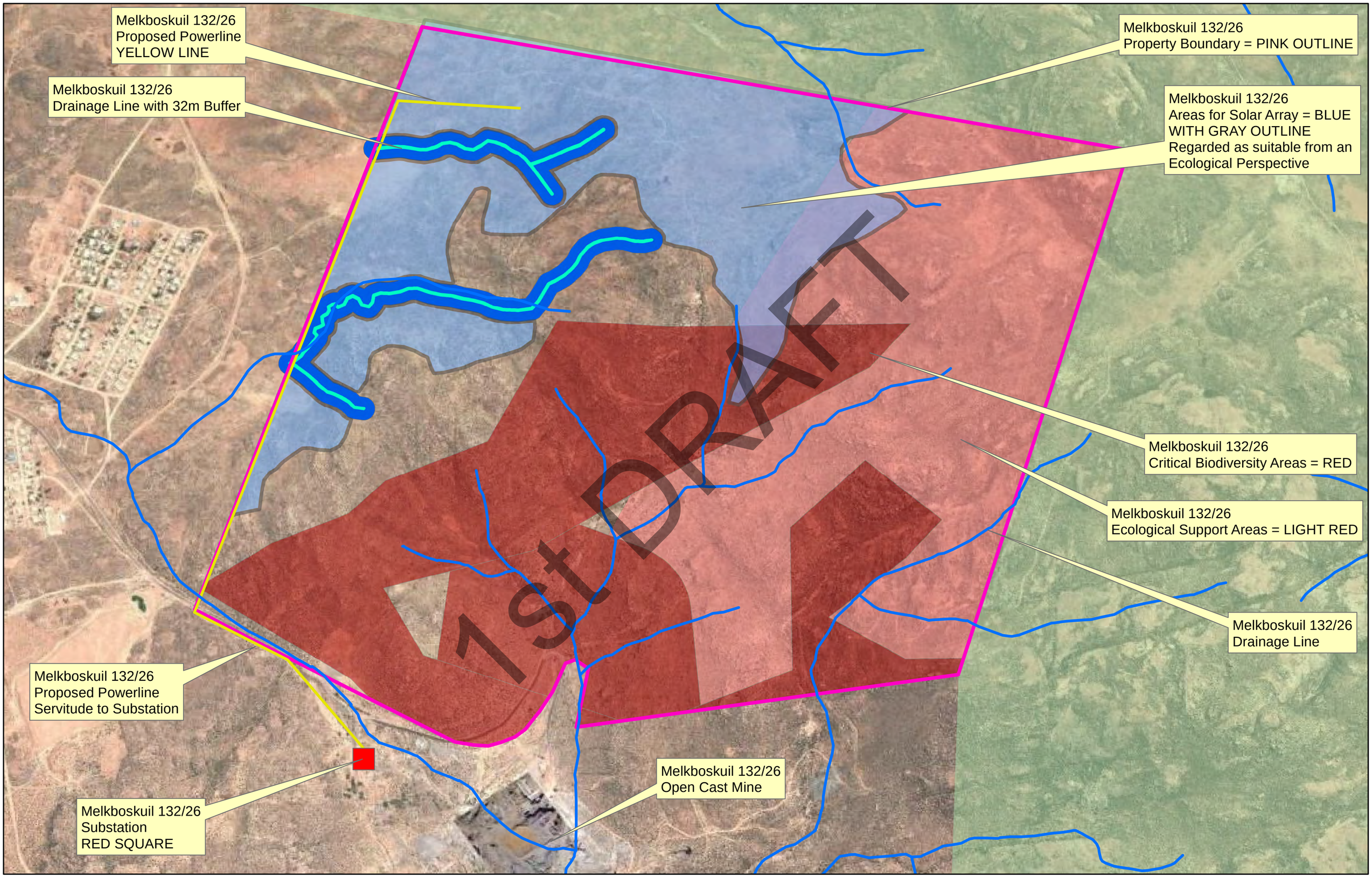


Scale : 1 : 6899

0 135 270 540 810 1 080 Meters

N W E S

APPENDIX A4 : Ecological Sensitivity Map, Melkboskuil 132/26.



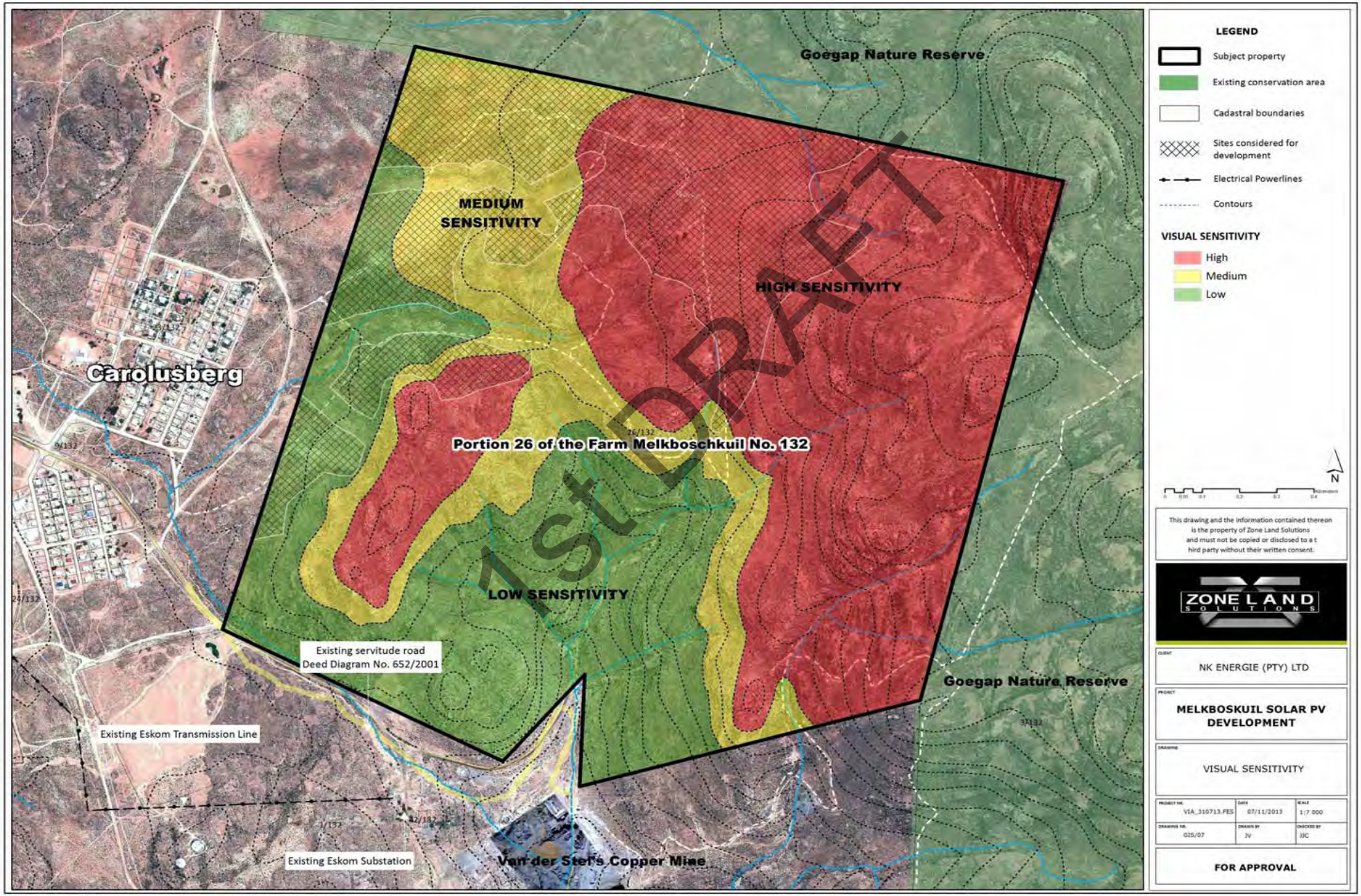
Two Vegetation Types occur on Melboskuil both are regarded as Least Threatened. The rocky outcrops from the centre of the property Eastwards are Namaqualand Klipkoppe Shrubland. The western sandy area identified as suitbale for the construction of the solar array is Namaqualand Blomveld.

Scale : 1 : 10000

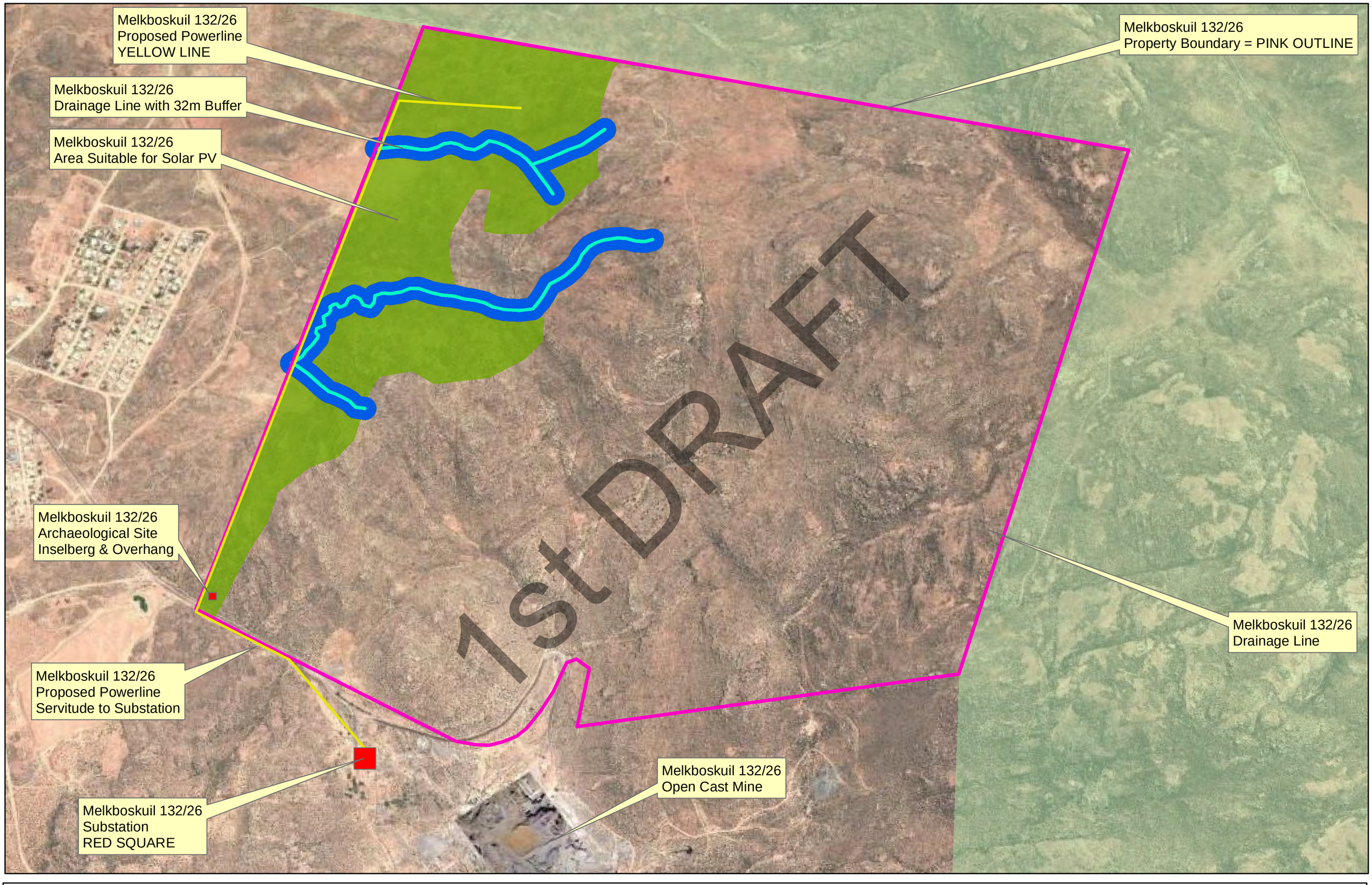
0 135 270 540 810 1 080 Meters

N W E S

APPENDIX A5 – Visual Sensitivity Map, Melkboskuil 132/26



APPENDIX A6 : Composite Sensitivity Map, Melkboskuil 132/26.



The green shaded polygon in the map above represents the area suitable for development as a solar PV Array. The area is a composite overlay of areas suitable from an ecological, visual, agricultural and archaeological perspective.

Scale : 1 : 10000

0 135 270 540 810 1 080 Meters

N W E S

APPENDIX B – SITE PHOTOGRAPHS

APPENDIX B : Melkboskuil 132/26. Photo Points

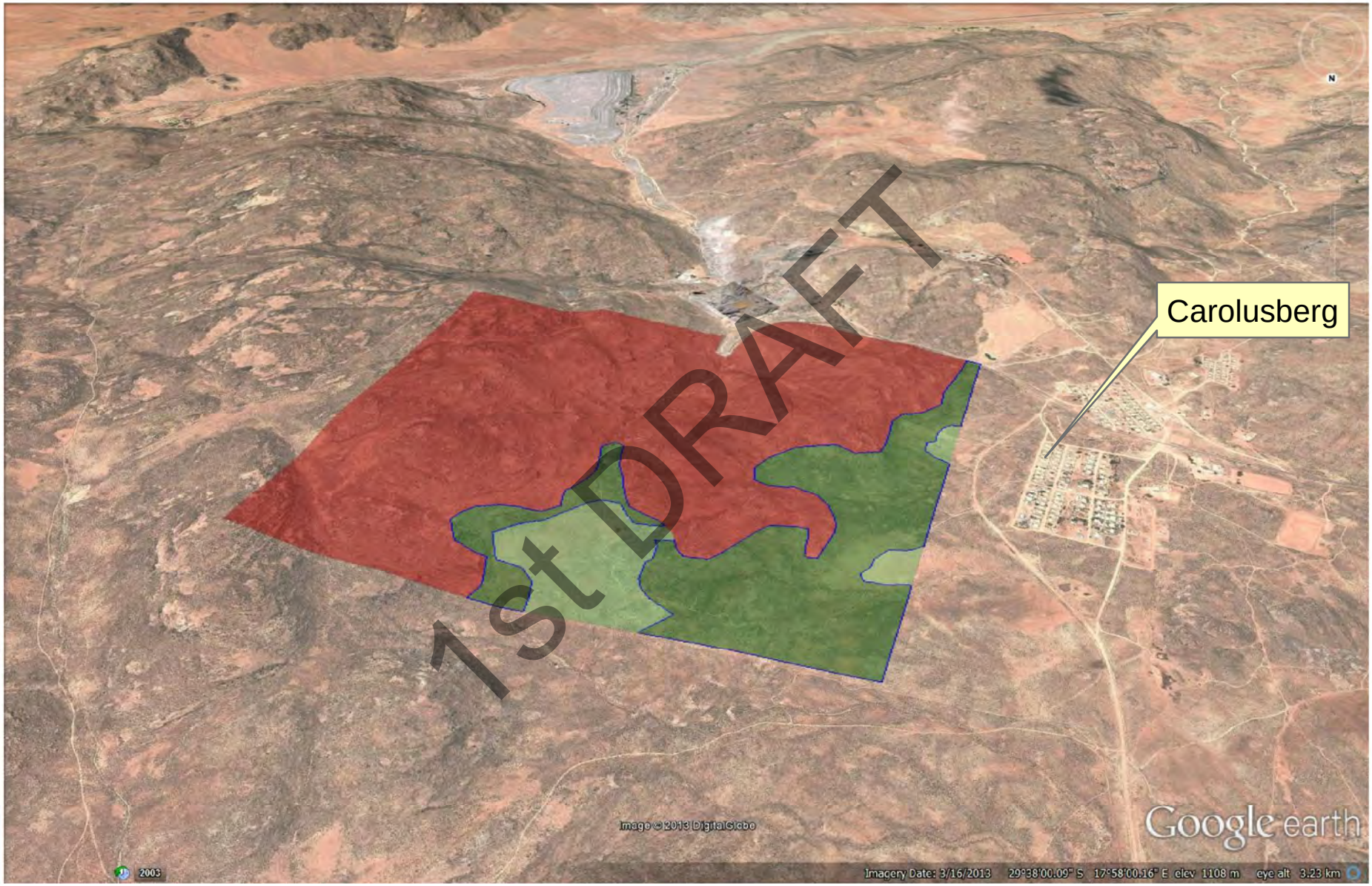
FOOTPRINT Environmental Services

Scale : 1 : 10000

0 135 270 540 810 1 080 Meters

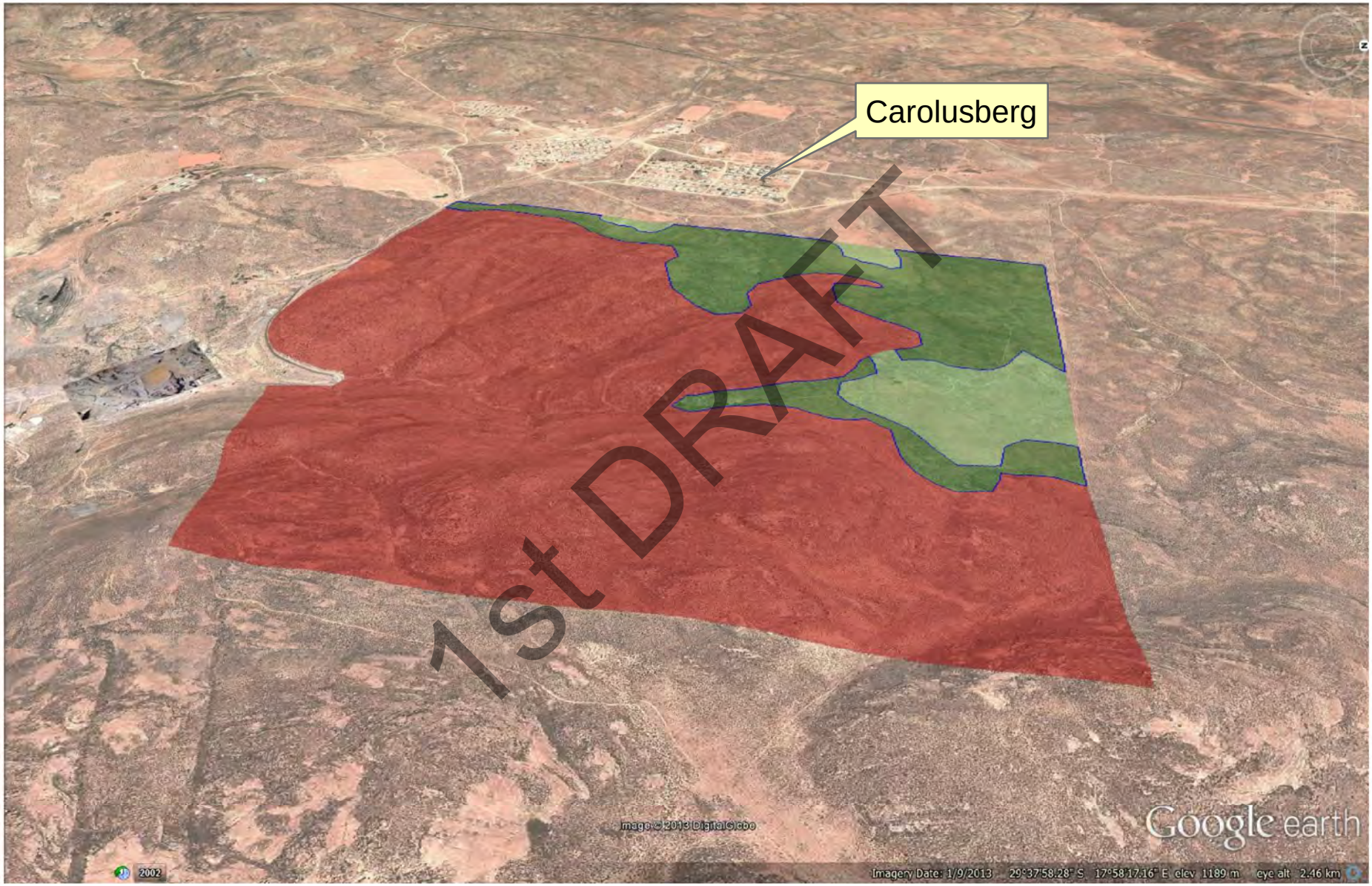
N
W E
S

View of Melkboskuil from North to South

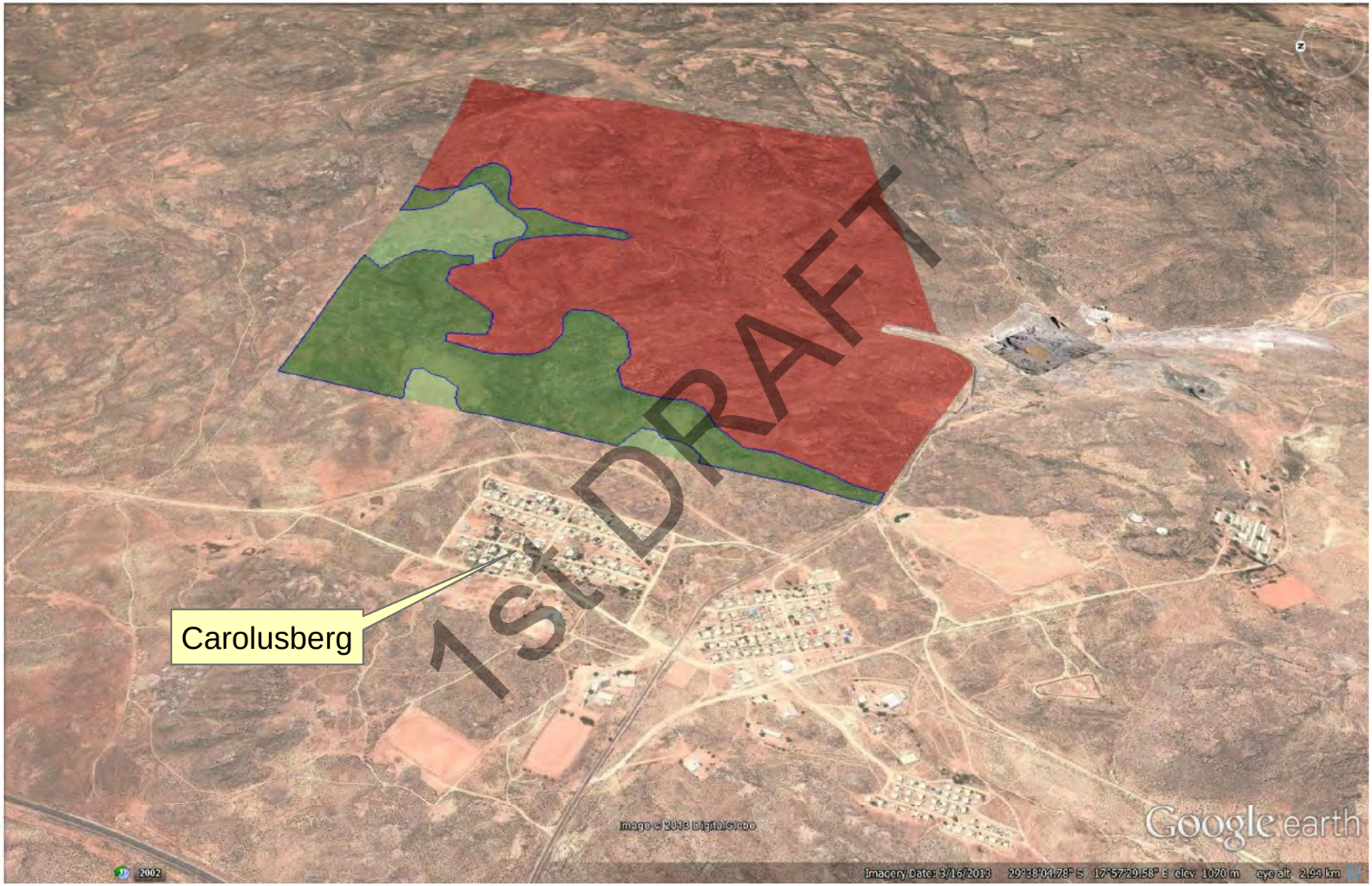


View of Melkboskuil from South to North

View of Melkboskuil from East to West

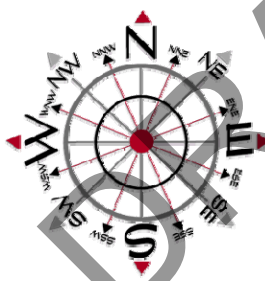


View of Melkboskuil from West to East



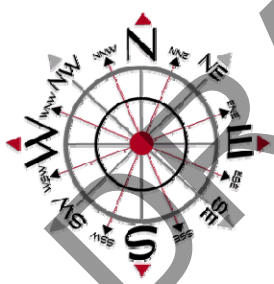
Alternative S1 : Photo Site 1

Alternative S1 : Photo Site 2





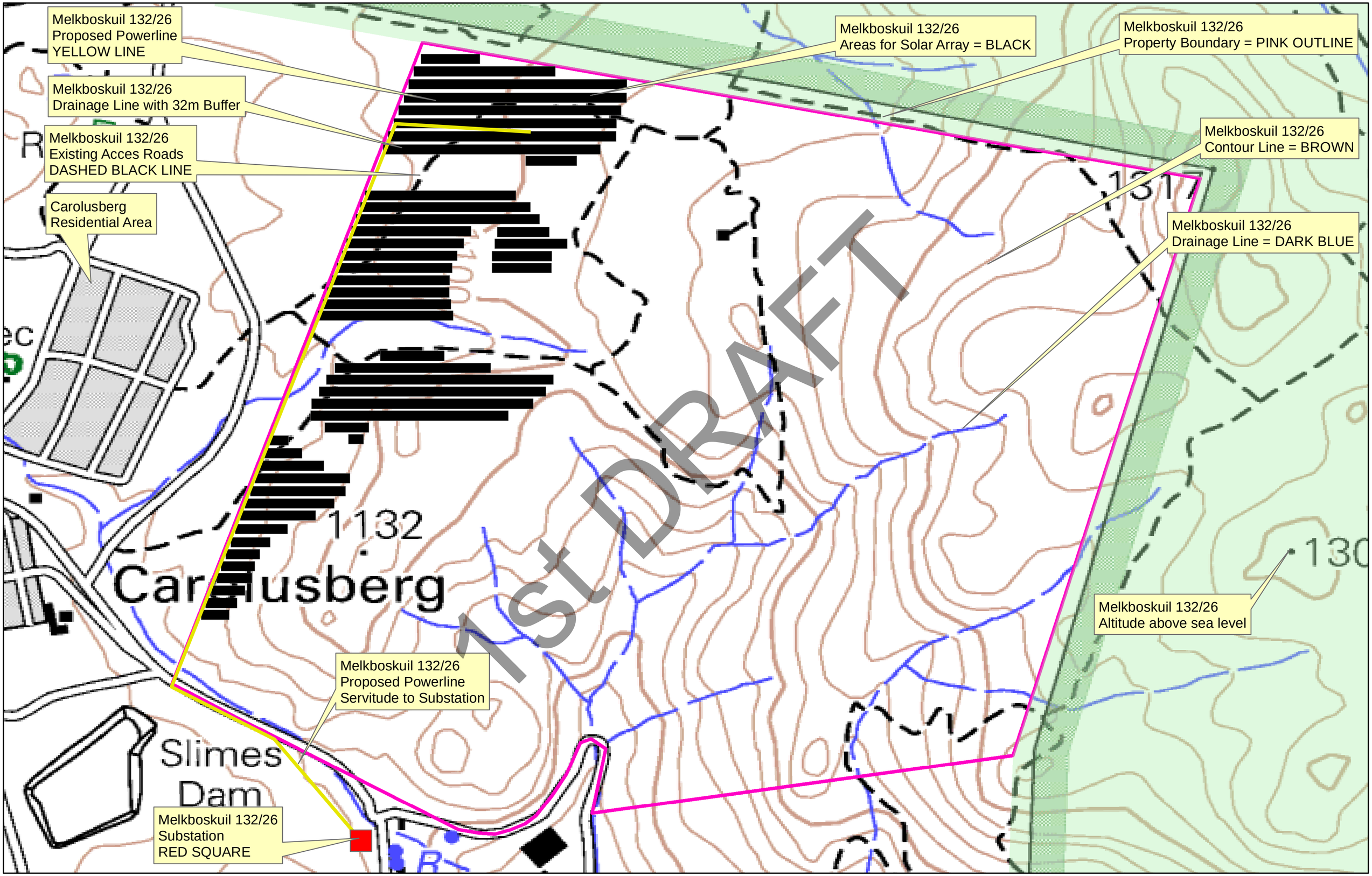

Alternative S1 : Photo Site 3






APPENDIX C – FACILITY ILLUSTRATION

APPENDIX C1 : Facility Illustration - Melkboskuil 132/26.



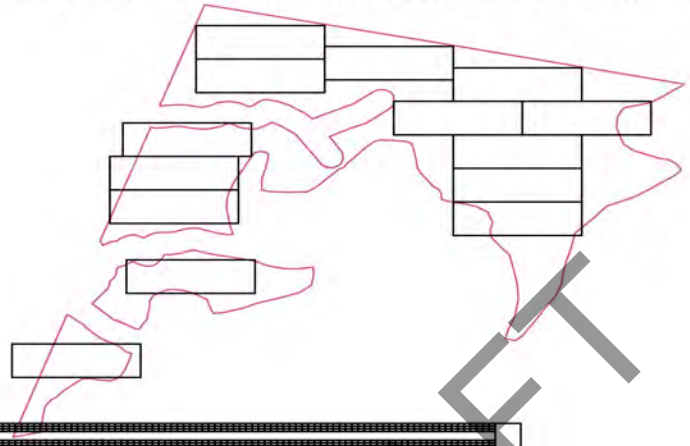
The black shaded polygon in the map above represents the area suitable for development as a solar PV Array. The final layout of the facility will be determined by the detailed survey of the site prior to construction.

Scale : 1 : 15 000

0 125 250 500 750 1 000 Meters

N W E S

14 SOLAR FIELDS 105.840 MODULES 31.222.800 Wp WITH MODULES OF 295 Wp



SOLAR FIELD WITH FIXED STRUCTURES
7560 MODULES OF 72 CELLS

2.230.200 Wp WITH MODULES OF 295 Wp

REVISION	REV. DATE	DESIGN	CHECK	DRAW	OBSERVATION
A	-	A.V.F.	-	A.V.F.	Review for technical bid

CUSTOMER:

PROJECT: MELKOBOS

TITLE: SOLAR FIELD DESIGN CRITERIA II

elecnor

CODE: HN-01-004 | SCALE: -

PAGE: 1 OF: | FORMAT: A2

APPENDIX D1 – SPECIALIST AGRICULTURAL REPORT

Johann Lanz
Soil Scientist (Pri.Sci.Nat.)
Reg. no. 400268/12

Cell: 082 927 9018
e-mail: johann@johannlanz.co.za
Fax: 086 551 7672

PO Box 6209
UNIEDAL
7612
Stellenbosch
South Africa

Agricultural Impact Assessment Report for proposed <20mw solar PV energy facility on farm 132/26, Melkboskuil near Springbok, Northern Cape Province

Basic Assessment Report

Report by Johann Lanz
October 2013

environmental affairs
Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

DETAILS OF SPECIALIST AND DECLARATION OF INTEREST

	(For official use only)
File Reference Number:	**12/12/20/**
NEAS Reference Number:	**DEAT/EIA/**
Date Received:	

Application for authorisation in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended and the Environmental Impact Assessment Regulations, 2010

PROJECT TITLE

Proposed Construction of a <20MW Solar PV on farm 132/26, Melkboskuil within the Nama Khoi Municipality in the Northern Cape Province (DEA Ref 14/12/16/3/3/1/974).

Specialist:	**Private Soil Science Consultant**	
Contact person:	**Johann Lanz**	
Postal address:	**P.O. Box 6209, Stellenbosch**	
Postal code:	**7612**	Cell: **082 927 9018**
Telephone:	**021 866 1518**	Fax:
E-mail	**johann@johannlanz.co.za**	
Professional affiliation(s) (if any)	**South African Council for Natural Scientific Professions**	

Project Consultant:	**Footprint Environmental Services**	
Contact person:	**Charl du Plessis**	
Postal address:	**P.O. Box 454, Porterville**	
Postal code:	**6810**	Cell: **079 172 4340**
Telephone:		Fax: **086 608 8304**
E-mail	**charlduplessis2@afrihost.co.za**	

4.2 The specialist appointed in terms of the Regulations

I, **Johann Lanz** , declare that --

General declaration:

1. I act as the independent specialist in this application
2. I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant
3. I declare that there are no circumstances that may compromise my objectivity in performing such work;
4. I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, regulations and any guidelines that have relevance to the proposed activity;
5. I will comply with the Act, regulations and all other applicable legislation;
6. I have no, and will not engage in, conflicting interests in the undertaking of the activity;
7. I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
8. all the particulars furnished by me in this form are true and correct; and
9. I realise that a false declaration is an offence in terms of Regulation 71 and is punishable in terms of section 24F of the Act.

Signature of the specialist:

Name of company (if applicable):

09 September 2013

Date:

Table of Contents

Executive Summary

The key findings of this study are:

- The development will have a low impact on agricultural resources and productivity and so from an agricultural point of view it is recommended to go ahead, subject to the provided mitigation measures.
- The significance of agricultural impacts is strongly influenced by the fact that the site has extremely limited agricultural potential. The majority of the farm has a land capability classification of class 8, non-utilisable wilderness land, and only a portion is class 7, non-arable, low potential grazing land.
- Agricultural limitations are aridity, mountainous terrain and extremely shallow, sandy soils on rock.
- The only agricultural land use is low intensity grazing of small stock.
- Four potential negative impacts of the development on agricultural resources and productivity were identified as:

    - Loss of agricultural land use caused by direct occupation of land by the energy facility footprint (medium significance with and without mitigation).
    - Soil erosion caused by alteration of the surface run-off characteristics (low significance with and without mitigation).
    - Degradation of veld due to vehicle trampling and other direct disturbance (low significance with and without mitigation).
    - Loss of topsoil in disturbed areas, causing a decline in soil fertility (low significance with and without mitigation).

Mitigation measures are provided to limit the effect of these negative impacts.

- One potential positive impact of the development on agricultural resources and productivity was identified as:

    - Generation of additional, alternative land use income for land owner from energy facility rental, resulting in improved financial sustainability of farm (low significance with and without enhancement).

1 Introduction

NK Energie (Pty) Ltd is proposing to develop a <20MW Solar PV energy facility on farm 132/26, Melkboskuil, adjacent to the east of the settlement of Carolusberg and approximately 10km north-east of the town of Springbok in the Northern Cape Province (see Figure 1). The development will consist of arrays of photovoltaic panels supported by mounting structures, an inverter station, internal access roads, cabling, fencing, a building for a workshop, storage and offices, and a substation with a connection to the Eskom grid. The footprint of the solar array will be less than 20 hectares.

The development requires a Basic Assessment. Johann Lanz was appointed by Footprint Environmental Services as an independent specialist to conduct an Agricultural Impact Assessment on the proposed development. The purpose of this Agricultural Impact Assessment Report is to describe the soils and agricultural potential of the proposed site and the potential impacts that the development may have on agricultural resources and production.

Figure 1. *Location of the proposed solar development (farm boundary in red) north-east of Springbok.*

2 Terms of reference

The terms of reference for this report are based on the requirements for an agricultural study as set out in the National Department of Agriculture's document, *Regulations for the evaluation and review of applications pertaining to renewable energy on agricultural land*, dated September 2011.

The above requirements together with requirements for an EIA specialist report may be summarised as:

- Identify and assess all potential impacts (direct, indirect and cumulative) of the proposed development on soils and agricultural potential.
- Describe and map soil types (soil forms) and characteristics (soil depth, soil colour, limiting factors, and clay content of the top and sub soil layers).
- Map soil survey points.
- Describe the topography of the site.
- Describe historical and current land use, agricultural infrastructure, as well as possible alternative land use options.
- Describe the erosion, vegetation and degradation status of the land.
- Determine the agricultural potential across the site.
- Provide recommended mitigation measures, monitoring requirements, and rehabilitation guidelines for all identified impacts.

Because of the small size of the development (<20MW), the fact that only a Basic Assessment, and not a full Environmental Impact Assessment (EIA) is required, and the fact that it is on land with extremely low agricultural potential, a purely desktop based study is justified and sufficient to adequately address all agricultural impacts.

3 Methodology of study

3.1 Methodology for assessing soils and agricultural potential

This desktop study is based on existing soil and agricultural potential data for the site. The source of data was the online Agricultural Geo-Referenced Information System (AGIS) produced by the Institute of Soil, Climate and Water (Agricultural Research Council, undated). Satellite imagery of the site available on Google Earth, as well as the elevation model that is part of Google Earth was also used for evaluation.

3.2 Methodology for determining impact significance

The following conventions were used in determining impact significance:

- The **extent**, wherein it was indicated whether the impact will be local (limited to the immediate area or site of development) or regional, and a value between 1 and 5 was assigned as appropriate (with 1 being low and 5 being high);
- The **duration**, wherein it was indicated whether:
  - the lifetime of the impact will be of a very short duration (0–1 years) – assigned a score of 1;
  - the lifetime of the impact will be of a short duration (2-5 years) - assigned a score of 2;

    - medium-term (5–15 years) – assigned a score of 3;
    - long term (> 15 years) - assigned a score of 4; or
    - permanent - assigned a score of 5;
- The **magnitude**, quantified on a scale from 0-10, where 0 is small and will have no effect on the environment, 2 is minor and will not result in an impact on processes, 4 is low and will cause a slight impact on processes, 6 is moderate and will result in processes continuing but in a modified way, 8 is high (processes are altered to the extent that they temporarily cease), and 10 is very high and results in complete destruction of patterns and permanent cessation of processes;
- The **probability** *of occurrence*, which shall describe the likelihood of the impact actually occurring. Probability will be estimated on a scale of 1–5, where 1 is very improbable (probably will not happen), 2 is improbable (some possibility, but low likelihood), 3 is probable (distinct possibility), 4 is highly probable (most likely) and 5 is definite (impact will occur regardless of any prevention measures);
- The **significance**, which shall be determined through a synthesis of the characteristics described above and can be assessed as low, medium or high;

The **significance** is calculated by combining the criteria in the following formula:

S=(E+D+M)P
S = Significance weighting
E = Extent
D = Duration
M = Magnitude
P = Probability

The **significance weightings** for each potential impact are as follows:

- < 30 points: Low (i.e. where this impact would not have a direct influence on the decision to develop in the area),
- 30-60 points: Medium (i.e. where the impact could influence the decision to develop in the area unless it is effectively mitigated),
- > 60 points: High (i.e. where the impact must have an influence on the decision process to develop in the area).

4 Description of the agricultural environment on site

4.1 Climate suitability and irrigation water availability

Rainfall for the site is extremely low and is given as 217 mm per annum, with a standard deviation of 72 mm according to the South African Rain Atlas (Water Research Commission, undated). The average monthly distribution of rainfall is shown in Table 1. In terms of the relationship between rainfall and evaporation the site is classified as arid. The aridity is the dominant factor that limits the agricultural potential of the site. There is no water available for irrigation.

Table 1. Average monthly rainfall for the site (29° 38' S 17° 58' E) in mm (Water Research Commission, undated)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	**Tot**
6	7	13	21	30	34	34	27	18	12	8	6	**217**

4.2 Terrain

A site plan of the farm is shown in Figure 2. The farm is approximately 310 hectares in extent and includes predominantly minimally transformed mountainous, Namaqualand veld which includes steep slopes and numerous exposed granite outcrops. The development footprint will affect only a small portion of the total farm (approximately 20 ha). Elevation varies between 970 and 1,300 meters above sea level. There are several small and only ephemeral water courses on the farm that run out of the mountains. The main one drains in a southerly direction. The north eastern parts of the farm are less mountainous and the natural vegetation has been disturbed in parts of this. The solar development will be located in this area (see Figure 2). It has a generally westerly aspect.

4.3 Soil conditions and agricultural suitability of the site

The geology of the site is granite and gneiss of the Namaqualand Metamorphic Complex.

The land type classification is a nation-wide survey that groups areas of similar soil and terrain conditions into different land types. There are two different land types across the farm (see Figure 2). The land type over most of the farm is Ib127 where rock outcrops dominate, interspersed with very shallow soils on underlying rock. Land type Ae80 is in that part of the farm where the solar development will be located. In this land type there are deeper red, sandy soils interspersed with the similar shallow soils of the other land type. A summary detailing soil data for the two land types is provided in Table 1.

Table 1. Land type soil data for site, listing all soil series that occupy more than 3% of the land type surface area.

Land type	**Land capability class**	**Soil series (forms)**	**Depth (cm)**	**Clay % A horizon**	**Clay % B horizon**	**Depth limiting layer**	**% of land type**
Ib127	8	Rock outcrop	0			R	69
		Hutton	10-30	2-4	3-8	R, db	17
		Glenrosa	10-20	3-8	4-10	so	5
		Mispah	5-15	1-3		R	4
		Hutton	10-30	2-4	3-8	ca, db	4
Ae80	7	Hutton	60-120	2-4	4-10	R	41
		Glenrosa	10-15	3-8	3-10	so	16
		Rock outcrop	0			R	14
		Hutton	60-100	2-4	4-10	ca, db	8
		Swartland	20-30	3-6	20-40	vp	7
		Mispah	5-10	2-3		R	5

Land capability classes:
7 = non-arable, low potential grazing land;
8 = non-utilisable wilderness land.
Depth limiting layers: R = hard rock; so = partially weathered bedrock; ca = hardpan carbonate; db = dorbank hardpan; vp = dense, structured clay layer.

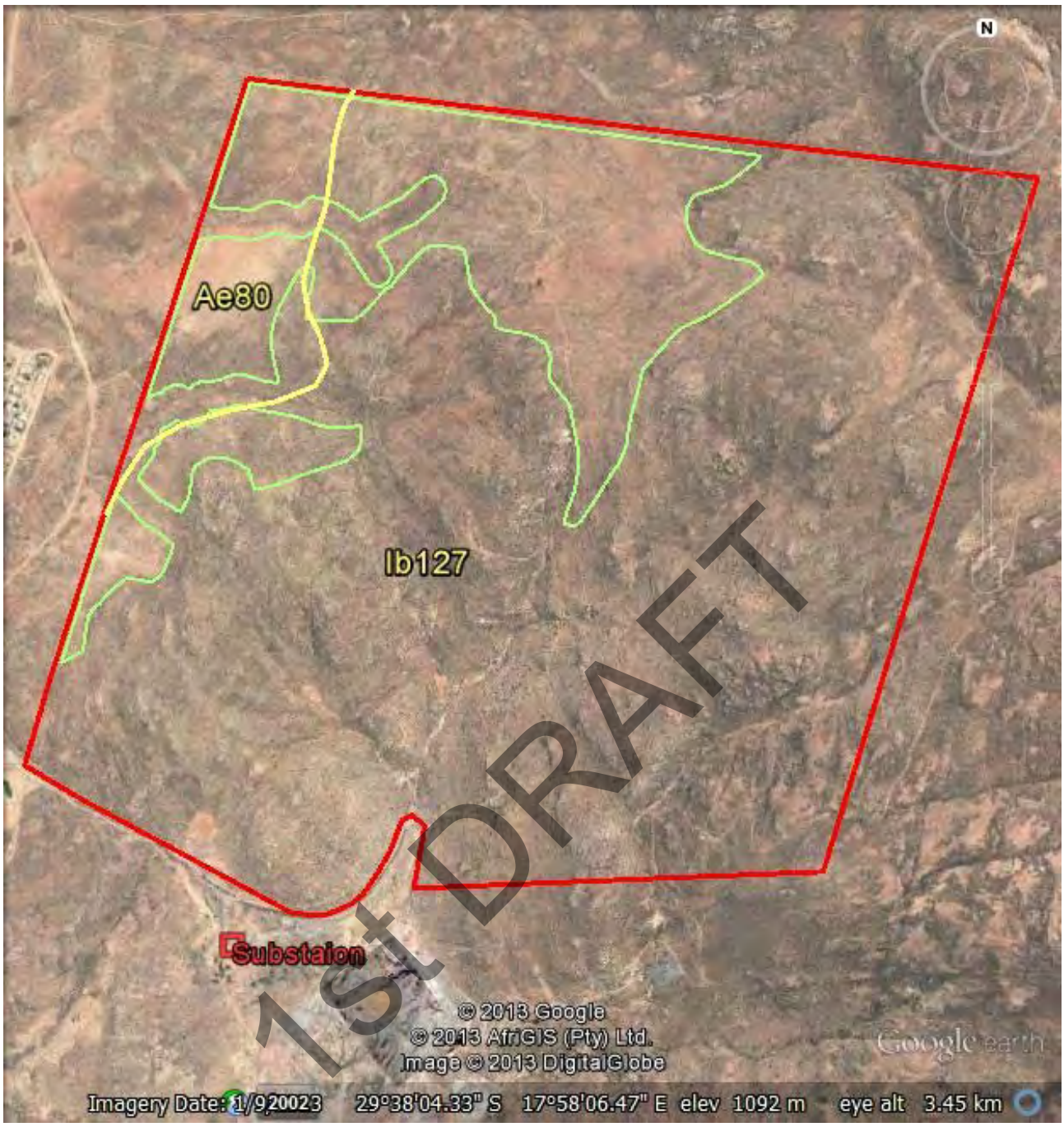


Figure 2. *Satellite image with farm boundary in red; potential areas for solar array outlined in green; land type boundary and labels in yellow.*

The soils on the farm have low erodibility, but because of the steep slopes there is still a reasonable erosion risk (class 5 and 6 erosion hazard).

Land capability is the combination of soil suitability and climate factors. Most of the farm (land type Ib127) is classified as Class 8 which is non-utilisable wilderness. A small portion of the farm (land type Ae80) is classified as Class 7, which is non-arable, low potential grazing land. Agricultural limitations are aridity, mountainous terrain and extremely shallow, sandy soils on rock. Grazing capacity is given for most of the farm as 31-40 hectares per animal unit. The north western side of the farm is slightly higher at 26-30 hectares per animal unit.

Figure 3. *Photographs of land conditions on site.*

4.4 Land use and infrastructural development at the site

There is no agricultural development or infrastructure on the farm. The land is only used for low intensity grazing of small stock. There are some jeep tracks that cross parts of the farm.

4.5 Erosion, vegetation and degradation status of the land

The Acocks veld type classification for the entire site is Karoo and Karroid type. The biome classification is Succulent Karoo and vegetation type is Upland Succulent Karoo. There are areas of the natural veld that have been disturbed in the past, mostly along the western boundary.

4.6 Possible alternative land use options for the site

Because of the climate, terrain and soil constraints the farm is totally unsuited to any type of cultivation. It is only suited to low intensity grazing of small stock, and there are no possible alternative agricultural land uses.

5 Identification and assessment of the impacts of the development on agriculture

The components of the project that can impact on agricultural resources and productivity are:

- Occupation of the site by the footprint of the facility
- Constructional activities that disturb the soil profile, for example for levelling, excavations, etc.

The following are identified as potential impacts of the development on agricultural resources and productivity, and assessed in the table formats below.

The most important factor that influences the significance of agricultural impacts is the fact that the proposed site is on land of extremely limited agricultural potential. The development footprint is also small (<20 ha) in relation to available land, which further limits the significance of agricultural impacts.

5.1 Impacts associated with all phases of the development - constructional, operational, and decommissioning

1. Loss of agricultural land use, caused by direct occupation of land by footprint of energy facility infrastructure, and having the effect of taking affected portions of land out of agricultural production.		
	Without mitigation	**With mitigation**
Extent	Low (1) - Site	Low (1) - Site
Duration	Long term (4)	Long term (4)
Magnitude	Small (1)	Small (1)
Probability	Definite (5)	Definite (5)
Significance	30 (Medium)	30 (Medium)
Status	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Mitigation: None possible		
Cumulative impacts: The overall loss of agricultural land in the region due to other developments. The significance is low due to the extremely limited agricultural potential of the solar panel site.		

2. Soil Erosion caused by alteration of run-off characteristics due to panel surfaces and access roads and having the effect of loss and deterioration of soil resources.		
	Without mitigation	**With mitigation**
Extent	Low (1) - Site	Low (1) - Site
Duration	Long term (4)	Long term (4)
Magnitude	Minor (3)	Small (1)
Probability	improbable (2)	Very improbable (1)
Significance	16 (Low)	6 (Low)
Status	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	No	No
Mitigation: Implement an effective system of run-off control which collects and disseminates run-off water from hardened surfaces and prevents potential down slope erosion. This should be in place and maintained during all phases of the development.		

3. Generation of additional, alternative land use income for land owner from energy facility rental resulting in improved financial sustainability of farm.		
	Without mitigation	**With mitigation**

Extent	Low (1) - Site	Low (1) - Site
Duration	Long term (4)	Long term (4)
Magnitude	Small (1)	Small (1)
Probability	Highly probable (4)	Highly probable (4)
Significance	24 (Low)	24 (Low)
Status	Positive	Positive
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Enhancement: None		

5.2 Impacts associated only with the constructional phase of the development

4. Degradation of veld due to vehicle trampling and other direct disturbance, during construction phase.		
	Without mitigation	**With mitigation**
Extent	Low (1) - Site	Low (1) - Site
Duration	Short term (2)	Short term (2)
Magnitude	Minor (3)	Small (1)
Probability	improbable (2)	Very improbable (1)
Significance	12 (Low)	4 (Low)
Status	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	No	No
Mitigation: Control vehicle access and constructional activity on roads and minimal footprint areas only.		

5. Loss of topsoil caused by poor topsoil management (burial, erosion, etc) during construction related soil profile disturbance (levelling, excavations, disposal of spoils from excavations etc.) and having the effect of loss of soil fertility on disturbed areas after rehabilitation.		
	Without mitigation	**With mitigation**
Extent	Low (1) - Site	Low (1) - Site
Duration	Short (2)	Short (2)
Magnitude	Minor (2)	Small (1)
Probability	Highly probable (4)	Very improbable (1)
Significance	20 (Low)	4 (Low)

Status	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	No	No
Mitigation: 1. Strip and stockpile topsoil from all areas where soil will be disturbed. 2. After cessation of disturbance, re-spread topsoil over the surface. 3. Dispose of any sub-surface, clay spoils from excavations where they will not impact on vegetated land, or where they can be effectively covered with topsoil.		

6 Monitoring of mitigation

OBJECTIVE: Ensure prevention of erosion through effective run-off control.

Mitigation: Action / control	**Responsibility**	**Timeframe**
Construct an effective run-off control system to collect and safely disseminate water from all surfaces and during all phases of the project, without causing downstream erosion. The system will need to adapt to changing conditions through the construction phase into the operational phase.	Construction managers / Environmental manager	Project life time
Performance Indicator	That no erosion occurs on or downstream of the site as a result of run-off from the site.	
Monitoring	Include periodical site inspection in environmental performance reporting that inspects the effectiveness of the run-off control system and specifically records occurrence or not of any erosion on site or downstream.	

OBJECTIVE: Conserve natural veld vegetation.

Mitigation: Action / control	**Responsibility**	**Timeframe**
Prohibit vehicular passage off designated roads.	Construction managers / Environmental manager	Project life time
Performance Indicator	That no vehicular trampling of in-tact veld occurs on site	
Monitoring	Include periodical site inspection in environmental performance reporting that specifically records occurrence or not of off-road vehicle tracks in specific areas. Periodical inspections should be more frequent during construction phase.	

OBJECTIVE: Ensure effective topsoil covering to conserve soil fertility on all disturbed areas.

Mitigation: Action / control	Responsibility	Timeframe
If an activity will mechanically disturb below surface in any way, then the upper 20-30 cm of topsoil (depending on the specific topsoil depth at the site of disturbance) should first be stripped from the entire disturbed surface and stockpiled for re-spreading during rehabilitation.	Construction managers / Environmental manager	Duration of the construction phase
Topsoil stockpiles must be conserved against losses through erosion by establishing vegetation cover on them.	Construction managers / Environmental manager	Duration of the construction phase
Dispose of all subsurface spoils from excavations where they will not impact on agricultural land or where they can be effectively covered with topsoil.	Construction managers / Environmental manager	Duration of the construction phase
The stockpiled topsoil must be evenly spread over the entire disturbed surface.	Construction managers / Environmental manager	During rehabilitation after construction / operation.

Performance Indicator	That no disturbed areas are left without an effective depth of topsoil covering.
Monitoring	Establish an effective record keeping system for topsoil management. These records should be included in environmental performance reports, and should include all the records below. Record the GPS coordinates of each area of disturbance. Record the date and depth of topsoil stripping and the GPS coordinates of the topsoil stockpiles. Record the date of cessation of constructional (or operational) activities at the particular site. Record date and measured depth of re-spreading of topsoil. Photograph the area after re-spreading of topsoil. Monitor the establishment of vegetation on all disturbed areas after re-spreading of topsoil, photograph vegetation establishment and record any occurrences of failure of vegetation establishment.

7 References

Agricultural Research Council. Undated. AGIS Agricultural Geo-Referenced Information System available at http://www.agis.agric.za/.

Water Research Commission. Undated. South African Rain Atlas available at http://134.76.173.220/rainfall/index.html.

APPENDIX D2 – SPECIALIST ECOLOGICAL REPORT

NICK HELME BOTANICAL SURVEYS
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Ph: 021 780 1420 cell: 082 82 38350 email: botaneek@iafrica.com
Pri.Sci.Nat # 400045/08

BOTANICAL AND FAUNAL ASSESSMENT OF PROPOSED PHOTOVOLTAIC ENERGY FACILITY NEAR CAROLUSBERG, MELKBOSKUIL 132/26, SPRINGBOK, NORTHERN CAPE.

Compiled for: Footprint Environmental Services cc, Paarl

Applicant: NK Energie (Pty) Ltd, Cape Town

4 November 2013

environmental affairs
Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

DETAILS OF SPECIALIST AND DECLARATION OF INTEREST

	(For official use only)
File Reference Number:	12/12/20/
NEAS Reference Number:	DEAT/EIA/
Date Received:	

Application for authorisation in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended and the Environmental Impact Assessment Regulations, 2010

PROJECT TITLE

Proposed construction of a <20MW Solar PV on farm 132/26 Melkboskuil within the Nama Khoi Municipality in the Northern Cape Province (DEA Ref: 14/12/16/3/3/1/974).

Specialist:	Nick Helme		
Contact person:	Nick Helme		
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Telephone:	021 7801420	Fax:	-
E-mail:	botaneek@iafrica.com		
Professional affiliation(s) (if any)	SACNASP		

Project Consultant:			
Contact person:			
Postal address:			
Postal code:		Cell:	
Telephone:		Fax:	
E-mail:			

4.2 The specialist appointed in terms of the Regulations_

I, Nick Helme, declare that

I act as the independent specialist in this application
I will perform the work relating to the application in an objective manner,even if this results in views and findings that are not favourable to the applicant
I declare that there are no circumstances that may compromise my objectivity in performing such work;
I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, regulations and any guidelines that have relevance to the proposed activity;
I will comply with the Act, regulations and all other applicable legislation;
I have no, and will not engage in, conflicting interests in the undertaking of the activity;
I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
all the particulars furnished by me in this form are true and correct;
and
I realise that a false declaration is an offence in terms of Regulation 71 and is punishable in terms of section 24F of the Act.

Signature of the specialist:

Nick Helme Botanical Surveys

Name of company (if applicable):

31 Oct 2013

Date:

Abridged CV:

Contact details as per letterhead.

Surname : HELME

First names : NICHOLAS ALEXANDER

Date of birth : 29 January 1969

University of Cape Town, South Africa. BSc (Honours) – Botany (Ecology & Systematics). 1990.

SACNASP Registration No: 400045/08 (Pri.Sci.Nat)

BEE Level Four Contributor BE # 1915.

Since 1997 I have been based in Cape Town, and have been working as a specialist botanical consultant, specialising in the diverse flora of the south-western Cape. Since the end of 2001 I have been working on my own and trade as Nick Helme Botanical Surveys, and have undertaken at least 900 site assessments during this period.

A selection of relevant work undertaken over the last few years is as follows:

- Baseline study of proposed Namakwa Sands expansion area (SRK Consulting 2013)
- Baseline and IA study of proposed Roode Heuvel mining area, west of Garies (CES 2013)
- Scoping study of proposed Karookop Wind Energy Facility near Vredendal (CSIR 2012)
- Botanical assessment for six proposed limestone and gypsum prospecting areas in the Knersvlakte (Vapopart & Tulsanite Pty Ltd 2012)
- Scoping study of proposed Photovoltaic Solar Energy Facility near Graafwater (Savannah Environmental 2012)
- Scoping study of proposed Olifants River Wind Energy Facility near Lutzville (Savannah Environmental 2011)
- Basic Assessment of three proposed sites for a new landfill for Matzikamma Municipality (Anel Blignaut Environmental Consultants 2010)
- Botanical assessment of proposed wind energy facility in the Knersvlakte near Juno substation, Vredendal (DJ Environmental 2010)
- Botanical scoping study of proposed Nama East and Nama West wind energy facilities near Springbok (DJ Environmental 2010)
- Botanical scoping and impact assessment of proposed wind energy facility on the Toringberg, west of Bitterfontein (DJ Environmental 2010)
- Botanical assessment for five proposed limestone prospecting areas in the Knersvlakte (Stellenryck Environmental Solutions 2010)
- Botanical assessment of a proposed development site near Graafwater (Footprint Consultants 2009)
- Botanical assessment of a proposed agricultural development near Rocher Pan (Footprint Consultants 2009)
- Botanical baseline and impact assessment of proposed St Helena Hills SDI area (DJ Environmental Consultants 2008, 2009)
- Botanical scoping and impact assessment for proposed Eskom Wind Energy Facility near Vredendal (Savannah Environmental 2007)

- Botanical assessment of Vredelus farm, Redelinghuys (Cederberg Environmental Assessment Practise 2007)
- Fine Scale vegetation mapping project in NW Sandveld (CapeNature 2007)
- Scoping and Impact Assessment for proposed new Eskom powerline from Alexander Bay to Vredendal (SEFSA 2006)
- Assessment of proposed Bound for Gold mineral sands exploration program on the west coast south of Brand se Baai (Amathemba Environmental 2006)
- Botanical assessment of proposed granite and limestone quarries in the Namakwa District (SitePlan 2006)
- Impact Assessment of proposed Namakwa Sands expansion project, Brand se Baai (Golder 2005)

TABLE OF CONTENTS

1. INTRODUCTION

This botanical and faunal Basic Assessment study was commissioned in order to help inform the environmental authorisation process being followed for a proposed new <20MW solar photovoltaic (PV) energy facility in the Springbok region of the Northern Cape. The proposed facility would be on Portion 26 of the Farm Melkboskuil 132, which lies 7km east of Springbok, south of the N14 highway, and north of the old Carolusberg mine. The northern and eastern boundary of the study area is the Provincial Goegap Nature Reserve. The study area is about 312ha in extent, and the total extent of the facility would be less than 20ha. A new 66kV powerline would connect the facility with the existing Carolusberg mine substation just south of the site, and would be about 2km long. The study area and the proposed powerline are shown in Figure 1. No alternative development layouts were proposed for assessment.

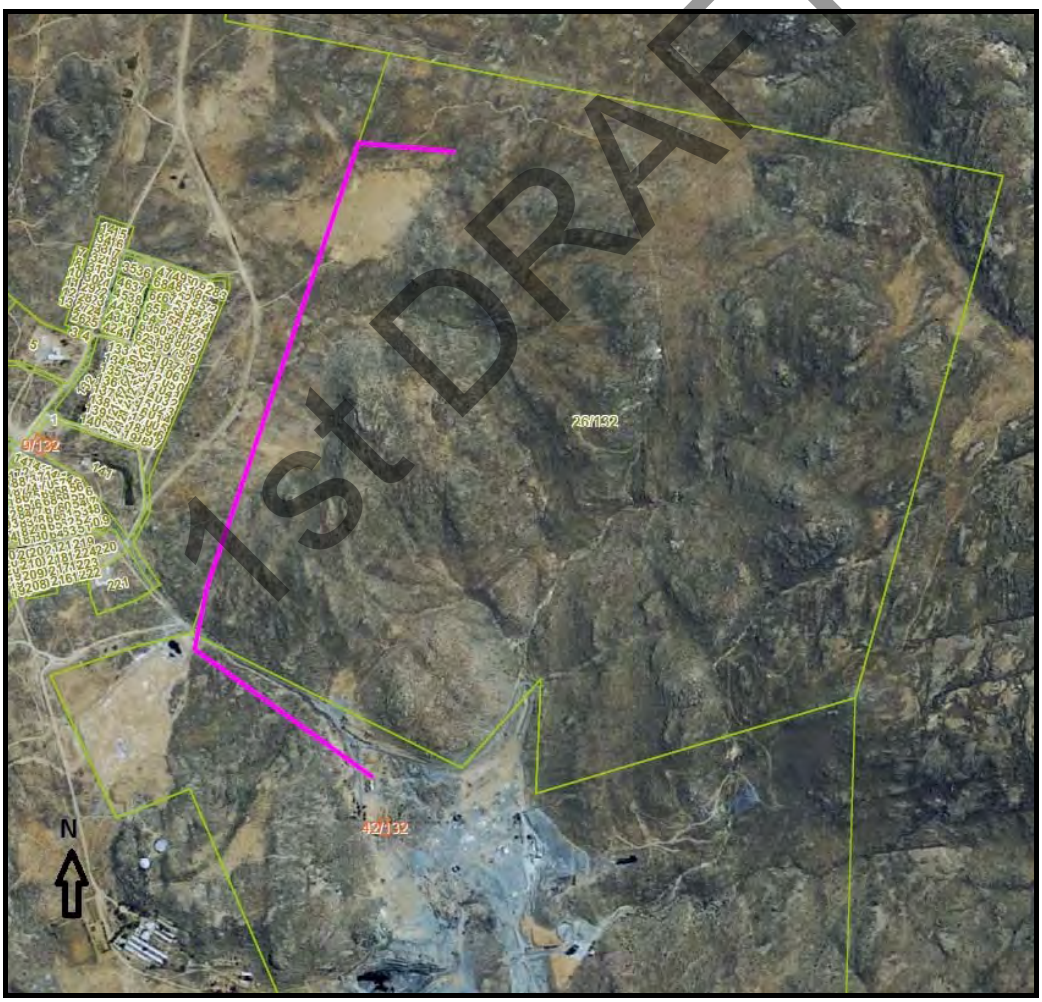

Figure 1: Map showing the Carolusberg study area (area marked 26/132; map courtesy of Footprint Environmental). The proposed 66kV powerline is shown in pink, and the existing Carolusberg settlement is visible to the west.

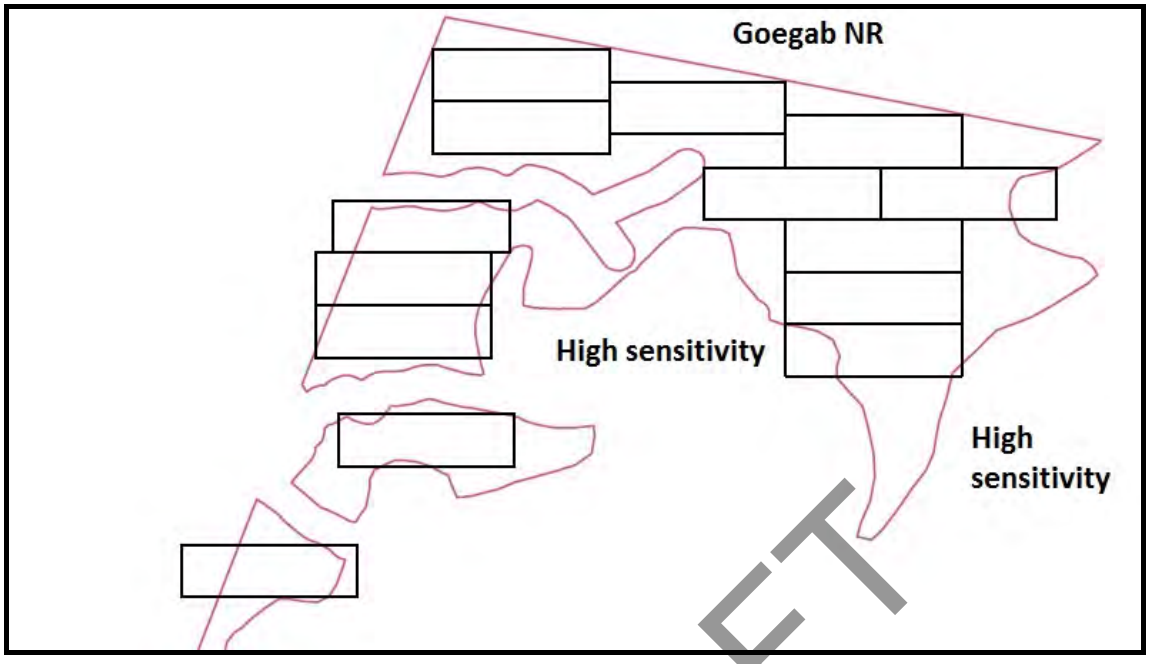

Figure 2: Proposed (schematic) layout of the solar PV units (black rectangles) as assessed, being largely within the areas mapped as being of Low or Medium ecological sensitivity (pink outlines). Access roads have not been provided in the proposed layout. It should be noted that the black rectangles cover an area of about 60ha, whilst the total footprint of the final development will be less than 20ha.

2. TERMS OF REFERENCE

The baseline part of the report should:

- identify and map any plant and faunal Species of Conservation Concern in the study area
- map all wetlands in the study area
- provide an overview and map of the ecological conservation significance (sensitivity) of the site

The impact assessment part of the report should:

- identify likely botanical and faunal impacts of the proposed development layout
- assess the significance of the ecological impacts, as per standard IA methodology
- provide recommendations in terms of facility layout and operation, in order to minimise the ecological impacts.

3. LIMITATIONS, ASSUMPTIONS AND METHODOLOGY

A site visit was undertaken on 7 July 2013, and the site was accessed on foot (due to locked gates). The focus of the survey was on the most likely areas for development (the flatter areas on deeper soils, being about 20% of the total study area), as the bulk of the greater study area is clearly not suitable for a PV development, on account of the steep and rocky terrain. Notes were made of the vegetation and fauna encountered, and various digital photographs were taken. The author has extensive experience in the region, and this, in combination with the available Google Earth imagery (the most recent being December 2012, which is of a high resolution and is easily interpreted) and a habitat based approach, means that the author has a high degree of confidence in the accuracy of the findings in this report.

Conservation value and sensitivity (terms which are often used interchangeably in ecological assessments) of habitats are a product of species diversity, plant community composition, rarity of habitat, degree of habitat degradation, rarity of species, ecological viability and connectivity, vulnerability to impacts, and reversibility of threats (which in this case generally refers to the rehabilitation potential of the habitat; high sensitivity habitats having low rehabilitation potential). The ecological sensitivity analysis methodology is outlined in Section 7. For purposes of this report the terrestrial faunal sensitivity is assumed to depend on the botanical sensitivity, unless otherwise noted, on the generally acknowledged basis that intact natural habitat is the key requirement of any threatened or localised fauna. Lists of possible mammal, reptile, amphibian and bird species are included in the Appendices. References are as noted in the text. No specific faunal surveys were undertaken, and incidental observations of faunal were made only whilst surveying the site and its vegetation. The faunal study is thus largely a desktop study (with references as noted in the text), as no faunal samples were made.

The development layout provided (Figure 2) is very schematic and lacking in detail, notably in terms of roads and cabling between the various rectangles, and in terms of security fencing, etc. It is thus not possible to provide an accurate assessment of the likely impacts without making various assumptions, which include 1) that all PV panels and internal electrical and road connections will be more than 95% within the black rectangles; 2) that the total development footprint will be less than 20ha in extent; 3) that additional access roads to the main rectangle areas will be

minimised, and will not cover more than a total area of 1ha, with roads no wider than 4m (2.5km of roads); and 4) that a palisade or razor wire security fence will be erected around the facility (but not around the whole study area).

It is assumed that the project will be in place for twenty years, and will then be decommissioned, failing which it will be refurbished and upgraded for further use.

4. STUDY AREA AND REGIONAL CONTEXT

The study area is located within what is now recognised as the Extra Cape Subregion (ECR) of the Greater Cape Floristic Region (GCFR; Snijman 2013), and is part of the Succulent Karoo biome. The GCFR is essentially defined by its predominantly winter rainfall, and a distinct flora. The GCFR is one of only six Floristic Regions in the world, and it is also by far the smallest floristic region. The Extra Cape Subregion occupies only 0.1% of the world's land surface, and supports about 3720 plant species, almost 20% of all the plant species in southern Africa, and some 8% of the plant species in sub-Saharan Africa. About 40% of all the plant species in the Extra Cape Subregion do not occur outside this region (Snijman 2013), and many have very small home ranges (these are known as narrow endemics). Although land use pressures are relatively low in the region (apart perhaps from overgrazing and mining), and there are consequently far fewer threatened plants in the region than in the Core Cape Region (commonly referred to as the Fynbos), many of the range restricted species are vulnerable to intense local development due to their very small ranges and specific habitat requirements.

The study area is part of what has been called the Namaqualand Hardeveld bioregion (Mucina & Rutherford 2006; Snijman 2013). This bioregion has a fairly distinct flora, and a particularly high number of locally and regionally endemic plant species, as well as plant Species of Conservation Concern (Snijman 2013, Raimondo *et al* 2009). The region is also known to support a high diversity of reptiles (Bates *et al* - in press) and scorpions (Prendini 2005).

The study area is within the planning domain of the Namakwa District Biodiversity Sector Plan (Desmet & Marsh 2008), which has identified and mapped Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs) throughout the region. Critical Biodiversity Areas are regarded as essential areas for the achievement of regional conservation targets, and are designed to ensure minimum land take for maximum result. ESAs are primarily animal movement corridors that

support the ecological functioning of the CBAs. The relevant map is shown in Figure 3, and it can be seen that about 65% of the total site is either a designated terrestrial CBA or ESA, mostly in the central and eastern areas. These CBAs were selected primarily for habitat heterogeneity and the importance of steep south facing slopes as potential climate refugia (Desmet & Marsh 2008). Two relatively minor seasonal streams drain the northern side, whilst there is a significantly deeper gorge on the southern side of the main watershed (Figure 3).

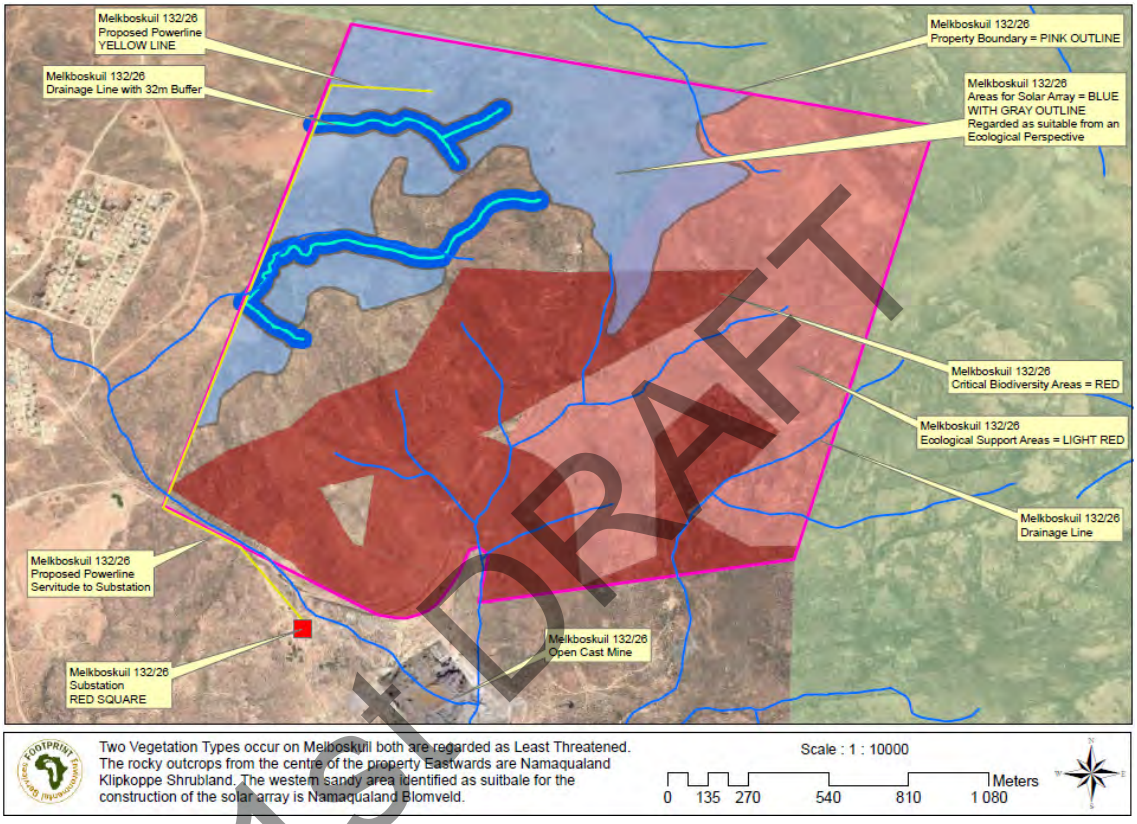

Figure 3: Map of the site showing the Namakwa District Biodiversity Sector Plan (Desmet & Marsh 2008) Critical Biodiversity Areas (red shading) and Ecological Support Areas (pink shading), plus drainage lines (blue) and the area deemed to be suitable for the proposed development (grey shading). Map courtesy of FES.

The Springbok area has an average annual rainfall of about 150mm, most of which falls in winter, although there are occasional summer thunderstorms (Mucina & Rutherford 2006). The wettest months are June, July and August. Evaporation rates are high, especially in summer, when daily temperature maxima are regularly over 30^{0}C. Daily winter maxima are usually in the range of 10 to 20^{o}C, although this can drop to less than 10^{o}C in the days during or following the passage of a cold front. Winter minima are regularly below 10^{o}C, although frosts are fairly rare (8 to 30

days per year). The geology in the study area is granite/gneiss, with associated coarse sands in the flats, derived from the weathered granites. The deeper soils are sandy loams. A watershed runs diagonally across the site towards the northeast, with the highest hills reaching 1250masl, and the lowest parts of the site being below 1000masl.

The current stocking rates on site are not known, but livestock (horses, goats and cattle) from the neighbouring Carolusberg area were grazing the site during my site visit. It is very clear that previous grazing impact has been relatively high, especially in the lower gradient western areas.

5. OVERVIEW OF THE VEGETATION

The SA Vegetation Map (Mucina & Rutherford 2006) indicates that two vegetation types occur in the study area – Namaqualand Klipkoppe Shrubland on the rocky parts, and Namaqualand Blomveld on the low gradient flats in the west (see Figure 4). Both vegetation types are regarded as Least Threatened on a national basis (DEA 2011). The Klipkoppe has about 95% of its original total extent still remaining, and about 6% is protected, whilst the Blomveld has a similar percentage remaining but only about 1% is protected (Rouget *et al* 2004). The Klipkoppe Shrubland is widespread in the Bitterfontein to Springbok region, and is characterised by rocky granite (or gneiss) hills, separated by sandy slopes and valleys, and often forms part of the escarpment. The Blomveld ranges from Steinkopf to Kliprand, and occurs mostly at the extreme eastern fringes of the Succulent Karoo, on the high plateau.

Three distinct habitats or plant communities occur within the study area (see Figure 4) - deeper sandy soils on the flats; shallow rocky soils, mostly on the hills; and the seasonal drainage lines in the valley bottoms and gulleys.

Sandy Flats

The sandy flats are restricted to two areas of about 56ha in the western part of the study area (Figure 4), and these are the areas that would have supported Namaqualand Blomveld.

Most of the sandy flats are heavily grazed, and about 60% have been previously cultivated (probably more than twenty years ago). The most southerly patch of this habitat was the site of a stock kraal, and is consequently very heavily grazed and

trampled. The natural vegetation in most of this habitat is relatively species poor, and is dominated by pioneer and weedy species, some of which are unpalatable to livestock. The dominant indigenous plant species in this area are widespread and resilient weedy species such as *Galenia africana* (kraalbos), *Dorotheanthus bellidiformis* (bokbaaivygie), *Helichrysum herniarioides, Heliophila variabilis, Chrysocoma ciliata* (bitterbos), *Hermannia trifurca, Adenogramma glomerata, Conicosia pugioniformis* (vetkousie), *Arctotheca fastuousa, Rhynchopsidium pumilum, Ruschia* sp*., Manulea decipiens, Hermannia amoena* and *Ursinia cakilefolia*. Additional indigenous species include *Euphorbia rhombifolia, Cheiridopsis denticulata, Massonia depressa* (krimpvarkie), *Chlorophytum undulatum, Zygophyllum spinosum, Limeum aethiopicum, Lotononis* sp*., Pentzia incana* (ankerkaroo), *Tripteris oppositifolia, Lycium* sp., *Zalusianskya* sp*., Suessenguthiella scleranthoides, Pteronia divaricata, Oxalis flava* and *Oxalis obtusa*. Invasive alien plant species are not a major feature of this habitat on site, and the primary one is *Atriplex lindleyi* ssp *inflata* (blasiebrak). This is a very widespread small perennial, and is likely to be common in any areas with disturbed soil.

Overall open space in the previously disturbed parts of this habitat is as high as 70-80%(see Plate 2), declining to about 50% in the areas not previously cultivated (Plate 1). The ecological conservation value of the previously cultivated and heavily grazed and trampled parts (about 80%) of this habitat is Low at a site and regional scale, and the less heavily disturbed areas (20%) have a Medium botanical conservation value.

No plant Species of Conservation Concern[1] (SCC) were recorded from within the sandy flats part of the study area, but SCC that may occur in this habitat are *Colchicum cruciatum* (Vulnerable; Raimondo *et al* 2009), which is restricted to the Springbok to Steinkopf area, *Gladiolus salteri* (Rare; from Springbok towards Aggeneys), *Moraea indecora* (Vulnerable; Nababeep to Goegab), *Oxalis exserta* (Rare; Concordia to Kamiesberg) and *Lachenalia concordiana* (Rare), which is more widespread. None of these are however likely to occur from within the more disturbed or heavily grazed parts of this habitat, and are thus unlikely to occur on site, nor within the development footprint.

[1] The Red List of South African Plants (Raimondo *et al* 2009) has assessed all plant species in South Africa, and all indigenous species are now technically Red Listed or Red Data Book species, and thus it is preferable to use the term Species of Conservation Concern to refer to species that are listed as either Threatened or Rare.

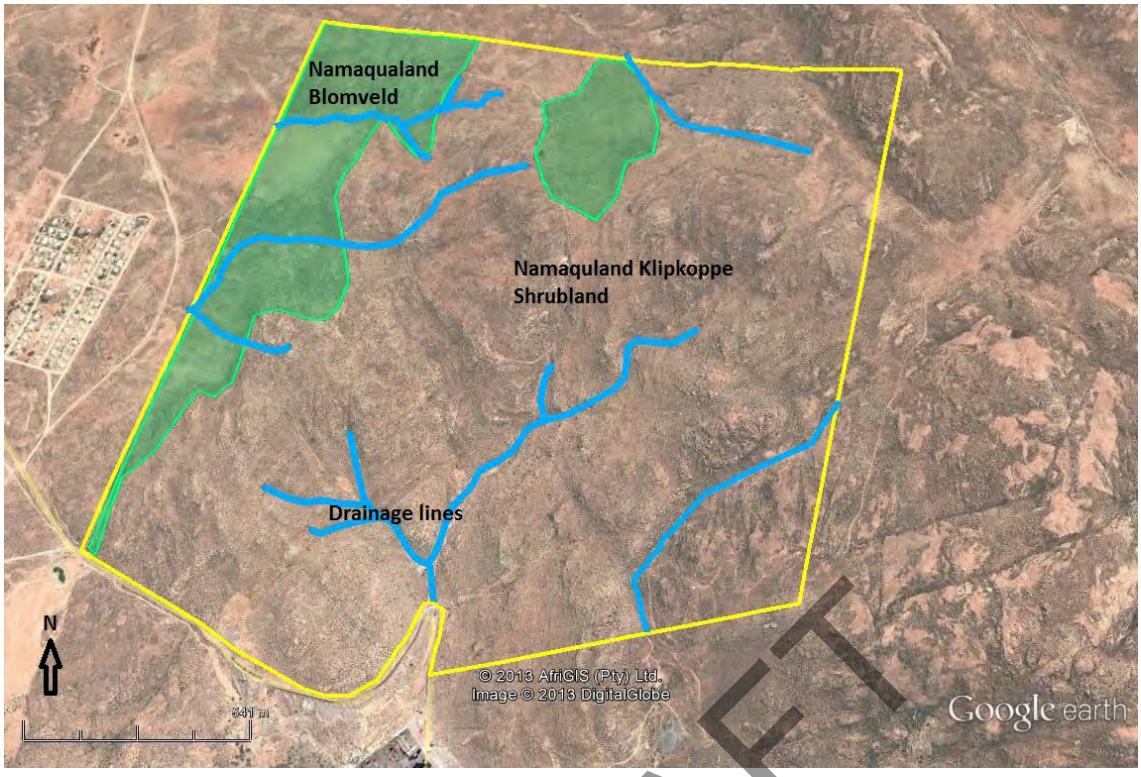

Figure 4: Image of the study area showing the three main habitats.

Plate 1: View of the northeastern part of the site, looking south, with the Goegab Nature Reserve fence visible at left. In the foreground and middle distance is Namaqualand Blomveld habitat (heavily grazed), with Namaqualand Klipkoppe Shrubland on the rocky hills behind. The skyline hills in the middle of the picture are on the site.

Plate 2: View of previously cultivated sandy flats, looking south towards the klipkoppe. Note the relative lack of plant cover in the foreground (20% cover), and the dominance of unpalatable kraalbos (*Galenia africana*; yellow shrubs).

Plate 3: View (looking north) of sparsely vegetated, previously cultivated sandy flats habitat (Low conservation value) in the middle distance, grading into some low rocky hills, and more densely vegetated sandy flats that were not previously cultivated (Medium and High conservation value).

Seasonal drainage lines

All the five drainage lines on site are seasonal, and hold surface water only for short periods after heavy rains, such as after thunderstorms, when erosive capacity may be high. The seasonal drainage lines in the western part of the site are less than 5m wide, with the actual channel usually being only about 1-2m wide. There are no dams on site, and there do not appear to be any springs.

Permeability on site is evidently high, and this, in concert with the relatively low rainfall, means that the drainage lines generally do not support a distinct flora, and many of the typical drainage areas species (such as *Acacia karoro, Salicornia*, etc) are missing. Indigenous plant species associated with the drainage lines include *Codon royenii, Zygophyllum foetidum, Scirpoides dioecus* and various annuals. No plant Species of Conservation Concern were recorded from within this habitat, and none are expected to occur, except possibly *Colchicum cruciatum* (Vulnerable).

The alien shrub *Atriplex lindleyi* ssp. *inflata* (blasiebrak) is present in some of the drainage lines, but it is never really problematic on site.

Figure 4: View (looking west) of one of the two main seasonal drainage lines (indicated in light blue) in the northern part of the site, looking east towards part of the Carolusberg town. The drainage line is poorly defined and is clearly not wet enough for long enough to support a distinct flora.

Rocky Hills

This habitat occupies the bulk (about 80%) of the study area, and is characterised by extensive exposed bedrock granite (or gneiss), boulders of various sizes, and intervening sandy areas. The habitat was not extensively or exhaustively surveyed, as it is clearly unsuitable for the proposed development, due to the steep slopes and rocky ground.

Plant species diversity in this unit is high, and prominent species include *Eriocephalus* sp.*, Calobota sericea, Thesium lineatum, Cheiridopsis denticulata, Ruschia* sp., *Aloe dichotoma* (kokerboom), *Aloe microstigma* ssp. *microstigma*, *Dyerophytum africanum, Hermannia amoena, H. cuneifolia, Pelargonium carnosum, Diospyros ramulosa, Tetragonia fruticosa, Euryops dreganus* (vaalrapuis), *Pentzia incana* (ankerkaroo), *Senecio junceus*, *Searsia undulata, S. burchellii, Ehrharta barbinodis, Polygala leptophylla, Didelta spinosa, Arctotis revoluta, Hirpicium alienatum, Adromischus* spp., *Crassula* spp., *Lopholaena cneorum, Euphorbia filiflora, Polymita albiflora, Othonna daucifolia, O. macrophylla, O. rechingeri* and *Zygophyllum retrofractum*. Cryptic, dwarf succulents on the rocky domes include *Conophytum pageae, C. bilobum*, *C. breve* and *C. roodii*.

There is a possibility that a number of plant Species of Conservation Concern (SCC) could be present in this habitat, and these include *Moraea fenestralis* (Rare), *Othonna euphorbioides* (Threatened), *Romulea namaquensis* (Near Threatened), *Lachenalia verticillata* (Rare), *Moraea indecora* (Vulnerable) and *Eriospermum pusillum* (Rare). Rare species that were recorded in this area include *Euphorbia filiflora* (not listed as a SCC; but it is a local endemic with low population numbers) and an unknown *Eriospermum,* both on the upper rocky slopes and peaks.

No significant populations of invasive alien plant species were observed within this habitat on site.

Plate 4: View of the northern slopes of the Namaqualand Klipkoppe Shrubland habitat on site, looking southwest.

5.1 Proposed Powerline route

A new 2.8km long powerline would need to be built to the existing Carolusberg substation, along the route shown in Figure 3. The route crosses mostly Low conservation value sandy flats (70% of route), heavily disturbed areas outside the study area (15% of route), three small drainage lines (3% of route), and runs along the base of the higher sensitivity rocky hills (12% of route). A new access track will need to be built along the western boundary of the site for this powerline, but it should be possible to use existing roads for the southern third of the route.

6. FAUNA

Mammals

A total of 53 terrestrial mammals and ten bat species occur or potentially occur within the study area (Appendix 1). The proximity of the site to both Springbok and the Carolusberg settlement and human activity is however likely to deter a number of shy species or species vulnerable to disturbance from the area, notably the larger species. The area is likely to experience some predation by feral and wandering dogs as well as poaching or harvesting by locals. The degraded nature of much of the sandy flats part of the area means that species able to tolerate relatively low plant cover are likely to predominate in these areas.

Species likely to be associated with the rocky parts of the site include the Namaqua Rock Mouse *Aethomys namaquensis* and Western Rock Elephant Shrew *Elephantulus rupestris*. The plains are likely to be dominated by ubiquitous, nocturnal small mammals such as Pygmy Mouse *Mus minutoides*, Cape Short-tailed Gerbil *Desmodillus auricularis* and Hairy-footed Gerbil *Gerbillurus paeba*. Middle-sized mammals which were observed on site include Cape Porcupine (quills, scat and diggings), Aardvark (diggings), Cape Hare and Yellow Mongoose. The only large mammal seen was the Klipspringer *Oreotragus oretragus*. Two Red Listed species are known to occur in the general area, namely Leopard *Panthera pardus* (Near Threatened) and Black-footed Cat *Felis nigripes* (Vulnerable). However, given the proximity of the site to Carolusberg and Springbok it is not likely that either occurs at the site on anything but an occasional basis, and these species are in fact more likely to frequent the eastern areas, which are further away from human influence.

The majority of bat species which occur in the area require caves or rock crevices for roosting sites. Such roosting sites are likely to occur within the large granite outcrops surrounding the site, as well as the mine adits and buildings of the abandoned mines nearby. Within the site itself, there are no likely bat roosting sites, and the development would result only in the potential loss of some low value bat foraging habitat as well as a very small risk of collision with the new powerline.

Overall, the study area is not likely to be an important area for terrestrial mammals or bats, and it is not likely that the development of a small portion of the site would result in a significant impact on the viability of the local populations of any mammal species.

Reptiles

The site lies in or near the distribution range of at least 57 reptile species (Appendix 2; Animal Demography Unit website; http://vmus.adu.org.za). This is a comparatively high total indicating that the area has a rich reptile assemblage. Based on distribution maps and habitat requirements, the composition of the reptile fauna is likely to comprise 3 tortoises, 20 snakes, 21 lizards and skinks, 12 geckos and 1 chameleon. Species observed at the site include the Spotted Desert Lizard *Meroles suborbitalis*, Variegated Skink *Mabuya variegata* and Western Rock Skink *Mabuya sulcata*.

The reptiles which may occur in the area include quite a large number of range restricted species and Namaqualand endemics. This includes the Speckled Padloper *Homopus signatus*, Namaqua Thick-toed Gecko *Pachydactylus namaquensis*, Namaqua Leaf-toed Gecko *Goggia rupicola,* Namaqua Day Gecko *Phelsuma ocellata* and Peers Girdled Lizard *Cordylus peersi*. A large proportion of these restricted and specialized reptiles which occur in the area are associated with granitic outcrops which provide habitat in the form of abundant cracks, fissures and exfoliating rock sheets. The many rocky outcrops in the study area would provide suitable habitat for at least some of these species, making it likely that many of these species occur in the study area, but not within the suggested development footprint (the flat, sandy areas). The majority of species which are associated with sandy lowlands are relatively widespread species. Exceptions which may occur at the site include the Thin-tailed Legless Skink *Acontias gracilicauda namaquensis,* which is a localized endemic (but not threatened) and Cape Whip Snake *Psammophis leightonii* (Vulnerable). Two other threatened species may occur in the study area, but are unlikely in the potential development area – the Speckled Padloper *Homopus signatus* (Vulnerable; Bates *et al* - in press) and Fisk's House Snake *Lamprophis fiskii* (Vulnerable).

Apart from a relatively small direct loss of habitat, the shading of the soil by the solar panels is likely to affect reptile composition on account of changes in soil temperature (presumably lower, due to more shading). Most reptiles are also sensitive to the amount of plant cover, which is also likely to be affected by site clearing as well as shading by the arrays. The presence of the arrays and electrical infrastructure would however create additional habitat for species which may utilize such structures (such as tubercled geckos (*Chondrodactylus* spp.) and agamas (*Agama* spp)). Depending on the management of the vegetation beneath the panels reptile abundance in the development area could increase as a result of increased habitat diversity as well as the protective effect of the panels on reptiles from avian predators. This would only benefit a small proportion of the species present and is not viewed as a positive outcome of the development.

Amphibians

The study area lies within or near the range of seven amphibian species (Appendix 3; Animal Demography Unit website; http://vmus.adu.org.za), including several Namaqualand endemics with moderately restricted ranges, including the Namaqua Stream Frog *Strongylopus springbokensis*, Namaqua Caco *Cacosternum namaquense* and Paradise Toad *Vandijkophrynus robinsoni*. None of the likely

species are however Red Listed as Species of Conservation Concern (Measy *et al* 2011). Many of the drainage lines in the study area are too small to provide regular breeding habitat for most of the potential species, which require water for breeding purposes, but three are likely within the greater study area, at least within the larger drainage lines, such as the main one east of the watershed (and outside the development footprint).

Given the lack of suitable habitat and the degraded nature of the proposed development area it is not likely that the actual site supports many amphibians. There is a small temporary dam just to the west of the study area that may however support further species.

The greatest threat to amphibians associated with the development is probably chemical and fuel/oil spills related to the construction activities, rather than the presence of the development in the long-term. Provided that suitable precautions are taken during the construction phase to reduce impacts such as pollution, then it is highly unlikely that the development would have a significant impact on amphibians.

Scorpions

The Springbok area is part of an identified centre of scorpion diversity (Prendini 2005), which extends north into the Richtersveld. Scorpions may be present both in rocky areas and sandy areas, and may thus be present in significant numbers in all parts of the study area. As they are mostly burrowing, nocturnal creatures no observations were made, and they are also presumably most diverse in the areas that have not been previously disturbed, paralleling the plant diversity patterns. It is possible that a number of threatened or localised species occur within the study area, but further work would be needed to determine this.

Butterflies

No threatened butterfly species are known to occur in the area (Mecenero *et al* 2013), although this does not mean that none are present. None butterflies were observe during the site visit, probably because it was too early in the main flying season (spring to early summer).

Avifauna

According the SABAP checklist (Animal Demography Unit website http://vmus.adu.org.za), 130 bird species are known from the area, including five Red Listed species (Table 1). The Red Listed species are all wide-ranging species with a broad distribution across the semi-arid parts of South Africa, and are not specifically concentrated within the study area. The site also does not fall within an area listed as an Important Bird Area (BirdLife South Africa: www.birdlife.org.za). Overall the study area is not likely to have an exceptional or remarkable avifauna.

The proposed powerline to link the development to the substation would pose a very small risk to certain birds. Although powerlines pose a significant collision risk to many medium and larger bird species, the length of the line would be fairly short (<3km), and it would also not traverse areas which are likely to experience a large amount of activity from potentially affected species. The potential avifaunal impact of the powerline is thus likely to be low, and loss of habitat very minor, and of no real consequence for any Red Listed bird species.

Table 1. Red Listed bird species known to occur within the vicinity of the proposed Carolusberg PV facility (according to SABAP 1 and 2 databases), and their risk of collision with or electrocution from power line infrastructure.

Species	Common Name	Status	Collision	Electrocution
Falco biarmicus	Lanner Falcon	NT	High	Low
Ciconia nigra	Black Stork	NT	Moderate	Low
Circus maurus	Black Harrier	NT	Low	Low
Neotis ludwigii	Ludwig's Bustard	VU	Moderate	Low
Polemaetus bellicosus	Martial Eagle	VU	Low	Moderate

7. ECOLOGICAL SENSITIVITY AND CONSTRAINTS ANALYSIS

Figure 5 is a visual summary of combined, overall ecological sensitivity of the study area.

Low sensitivity areas are usually areas that: have been heavily disturbed (soil disturbance); have a low botanical diversity and plant cover; are unlikely to support significant populations of plant or animal Species of Conservation Concern; are not within designated Critical Biodiversity Areas; do not provide key ecological linkages. Low sensitivity areas are the most appropriate areas for development and present no significant constraints to the proposed development. The total extent of the mapped Low sensitivity habitat is 24.8ha.

Medium sensitivity areas are usually areas that: are partly disturbed (may have been previously cultivated or heavily grazed); have a moderate level of botanical diversity and plant cover; are unlikely to support significant populations of plant or animal Species of Conservation Concern; are not within designated Critical Biodiversity Areas, but may provide a fair degree of ecological connectivity. Medium sensitivity areas could be considered for development and present no significant constraints to the proposed development, but should only be used if the development cannot all be accommodated within Low sensitivity areas. The total extent of the mapped Medium sensitivity habitat is 55ha.

High sensitivity areas are usually areas: with largely undisturbed soils (but may be subject to grazing); that have a high level of botanical diversity and plant cover (except where there is bare rock or very shallow soils); that are likely to support populations of plant or animal Species of Conservation Concern; that include all designated Critical Biodiversity Areas, and provide important ecological connectivity and habitat linkages. Most of the seasonal drainage lines are included within this category, as are most of the rocky outcrops.

High sensitivity areas are not appropriate areas for large scale development or habitat transformation, and development of a PV facility in these areas would potentially have High negative ecological impacts (both at the construction and operational phases). The powerline is unlikely to cross or impact on any High sensitivity areas.

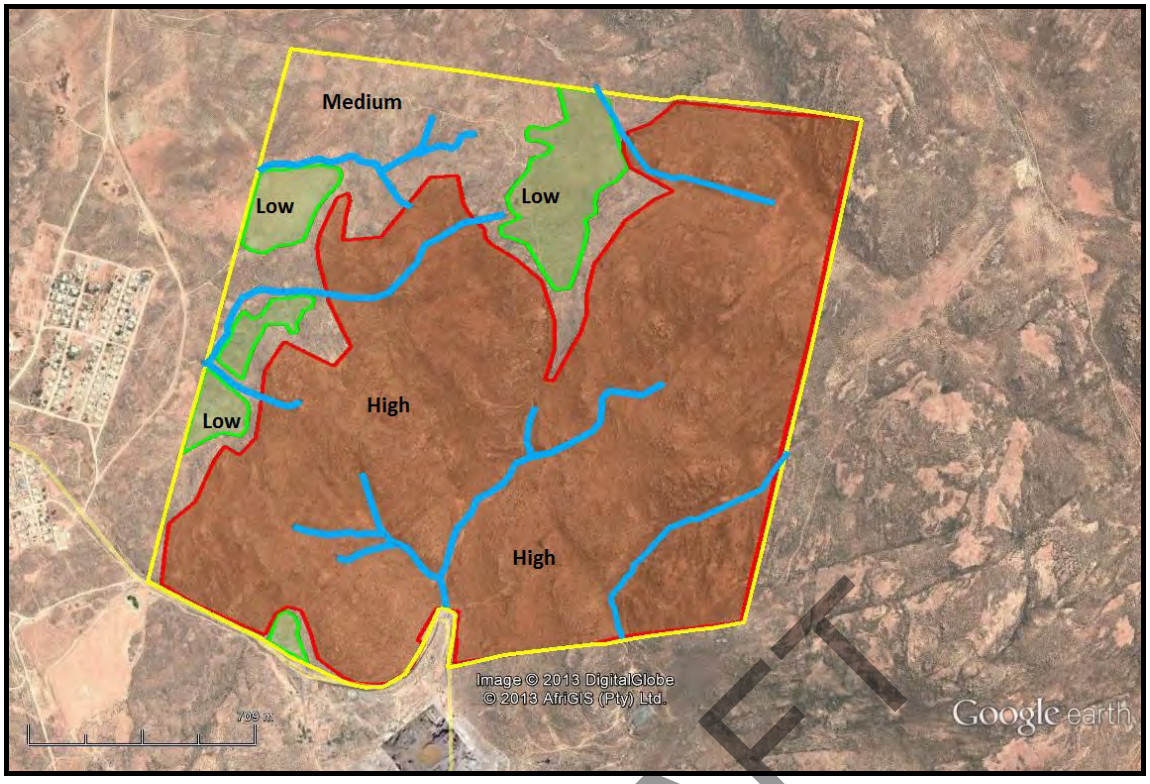

Figure 5: Map of the combined, overall ecological sensitivity of the study area. Unshaded areas are of Medium sensitivity, and blue lines are drainage lines, all of which are of High sensitivity.

8. ISSUES IDENTIFIED

In terms of the construction of the proposed photovoltaic panel infrastructure the following potentially negative ecological issues have been identified, although some are unlikely to be significant in the case of this project:

- Direct, permanent loss of Low, Medium or High Sensitivity vegetation and faunal habitat at the construction phase
- Direct, permanent impacts on fauna at the construction phase (loss of actual individuals)
- Temporary to long term direct loss and degradation of Medium and High Sensitivity vegetation and faunal habitat at the construction phase (laydown areas; work areas; access roads for powerline installation)
- Indirect ecological impacts at the operational phase (fragmentation of natural habitat and ecological corridors; reduction of subpopulations of rare/threatened fauna and flora species). Some of these impacts may be exacerbated by the requirement for security fencing around the facility.
- Direct impacts at the operational phase (collision and electrocution threats to certain birds from the powerline).

No potentially positive ecological impacts associated with this project have been identified, although certain smaller animals may benefit from the additional cover created by the photovoltaic panels. If livestock grazing on the property was removed for the duration of the project this would be an important positive impact, but unfortunately it seems that this cannot be recommended as required mitigation, as it would cause conflict in terms of the Dept. of Agriculture's requirements, etc.

9. IMPACT ASSESSMENT

9.1 Construction Phase Ecological Impacts

The primary direct botanical impact would be permanent loss of the natural and partly natural vegetation currently found in the proposed development areas, which would occur mostly at the construction phase.

The primary construction phase faunal impact would be permanent loss of habitat with the development footprints. Secondary construction phase impact could be mortality of actual animals, caused by site clearing, foundations and burying of cables. This would impact primarily on animals with low mobility, such as flightless invertebrates, and some amphibians and reptiles.

Assuming that the development footprint as shown in Figure 2 is largely accurate, the total development is likely to require 20ha in total. The following development would be required, and would have direct negative impacts on natural or partly natural vegetation within the development footprints:

- PV panel arrays, arranged in 14 units; the panels will be mounted on metal structures which will be fixed to the ground either through a concrete foundation or a deep seated screw (probably the former);
- Internal roads (minor gravel roads);
- Central inverter of approximately 3m x 2.5m x 1m;
- Trenching – all DC and AC wiring within the PV plant must be buried underground (and some may have to cross seasonal drainage lines);
- Fencing (palisade, not solid wall) around the entire development site, possibly with a booth to house a security guard;
- Laydown area and a workshop.

Additional development outside the designated footprints would be mainly the primary access roads (assumed to be up to 4m wide and up to 2500m long, hence covering up to 1ha), some of which would have to cross seasonal drainage lines.

Life form	Extent of impact	Duration of impact	Intensity	Probability of occurrence	Degree of confidence	Significance Rating
Vegetation	Local	Permanent	Medium	High	High	Medium negative
With Mitigation	Local	Permanent	Medium	High	High	Medium negative
Fauna	Local	Temporary to Permanent	Low - Medium	High	High	Low - Medium negative
With Mitigation	Local	Permanent	Low - Medium	High	High	Low - Medium negative
No Go	N/A	N/A	N/A	N/A	N/A	N/A

Table 1: Summary table for construction phase botanical and faunal impacts associated with the proposed development options. The primary impact is the loss of up to 20ha of habitat, as well as individuals within those areas.

9.2 Operational Phase Ecological Impacts

The primary operational phase botanical and faunal impacts are likely to be habitat fragmentation and the associated loss of current partial ecological connectivity, the possible introduction and facilitated spread of alien invasive vegetation (due to soil disturbance), and collision and electrocution impacts to certain birds from the powerline.

The density of the proposed development, however it is orientated, will impact on and reduce the presumably high level of ecological connectivity that is currently present on and across the site. Given that some connectivity will remain along the drainage lines and associated buffers, and that large areas of natural or similar partly natural habitat remain in the vicinity (some of which are designated ecological corridors and CBAs) this should have no more than a Low negative impact on a regional scale. Removal of grazing pressure on the site would enhance vegetation rehabilitation, in that significantly more seed will be available. This is particularly critical in the post decommissioning phase, and is essentially the only significant mitigation that could be put in place to reduce the operational (and

construction) phase impacts. Thus if livestock was prevented from using the study area for the duration of the project the operational phase botanical impacts could be reduced to Low – Medium negative, but as this cannot be recommended the impacts cannot be significantly mitigated, and remain at Medium negative.

The introduction and spread of alien invasive vegetation is strongly associated with soil disturbance, and thus the extensive disturbance associated with this project is likely to result in increased levels of invasive alien vegetation (both species diversity and density) within the development (disturbance) area. Presumably any taller, woody alien invasives would be controlled, as they would in time otherwise shade the panels, but the invasive grasses and herbs are unlikely to be controlled, and will in time may come to dominate the site. This is likely to have a Low negative overall impact on the surrounding or nearby natural vegetation and fauna, as the facility will be located partly in an area that is already disturbed, and which thus already has low levels of alien and weedy vegetation.

Life form	Extent of impact	Duration of impact	Intensity	Probability of occurrence	Degree of confidence	Significance Rating
Vegetation	Local	Permanent	Medium	High	High	Medium negative
With Mitigation	Local	Permanent	Medium	High	High	Medium negative
Fauna	Local	Temporary to Permanent	Low - Medium	High	High	Low - Medium negative
With Mitigation	Local	Permanent	Low - Medium	High	High	Low - Medium negative
No Go	Local	Temporary	Low	High	Medium	Neutral to Low negative

Table 2: Summary table for operational phase botanical and faunal impacts associated with the proposed development options.

The likelihood of bird mortality due to collision with the powerline is deemed to be low on a regional scale, as the line is short (<3km), close to a semi-urban area for much of its route, and at the base of a rocky hill area, all of which are likely to minimise the passage of vulnerable species such as bustards. The risk is slightly higher for fast flying raptors such as Lanner Falcon. Electrocution risk is likely to be

low for all but Martial Eagle (a very large bird prone to perching on pylons), and given the type of powerline (66kV) may actually be low for this species as well.

The confidence level in the assessment of operational phase botanical and faunal impacts is generally medium to high.

9.3 Cumulative Botanical and Faunal Impacts

The underlying vegetation types, habitats and species that will be impacted by the proposed development are both widespread in the region, with well over 90% of their original total extents still intact, and the loss of up to 20ha of this habitat and associated flora and fauna is thus likely to have a Low cumulative impact.

9.4 The No Go Alternative

The no development alternative would presumably entail continued use of the site as an agricultural area, primarily as grazing for small livestock (mainly sheep and goats). It is assumed that the remaining vegetation will be moderately to heavily grazed, but that at least most of the vegetation in the currently natural parts of the site, and within the <20ha development footprint, will remain largely intact, which is clearly a positive factor.

The ecological impact of the No Go scenario is likely to be Neutral to Low Negative, in that it is neither positive nor negative, and some degree of habitat rehabilitation potential remains for the previously cultivated areas as long as the entire site is not developed.

The No Go alternative is the marginally preferred alternative from an ecological perspective.

9.5 Positive Impacts

No potentially positive ecological impacts associated with this project have been identified, although certain smaller animals may benefit from the additional cover created by the photovoltaic panels.

If livestock grazing on the property was removed for the duration of the project this would be an important positive impact, but for various reasons (conflict with Dept. Agriculture, agricultural viability, etc.) it appears that this cannot be recommended as required mitigation. Removal of grazing by livestock would significantly enhance

growth, flowering and seed set of all palatable plant species on site, especially in the heavily grazed areas in the western parts of the site, and would reduce the current dominance of unpalatable species such as kraalbos. This would in turn provide more faunal habitat and food, and would also benefit much of the fauna. Post decommissioning rehabilitation of the development area would also be substantially enhanced if there were substantial, healthy adjacent plant populations with good seed availability.

10. MITIGATION REQUIREMENTS

The following mitigation is considered feasible, realistic and essential, and is factored into the assessment:

Construction Phase

- The approved development footprint, including access roads, must be fenced off and clearly demarcated by a surveyor prior to any site development. For purposes of construction the fencing need only be a single wire strand at a height of 1m, with warning signs attached every 30m. This demarcation is required so that contractors can clearly see the development area and do not damage any areas outside the approved footprint.
- Laydown and temporary storage areas, including for cement, should be within identified Low sensitivity areas.
- No cement or concrete should be spilled anywhere on site, and if it is, should immediately be gathered up and disposed of at an approved, licensed dump site.
- An ECO must be appointed to oversee the entire construction phase, and ensure compliance with all RoD requirements.
- The security fence around the development should be permeable to small terrestrial animals like tortoises and lizards, and hence should ideally be a palisade or bonox type fence with barbed or razor wire. There must not be a solid cement or concrete base that protrudes above ground level, or else it will not allow tortoises and the like to move through.
- All watercourses and seasonal drainage lines should have a minimum 32m buffer from their outer channel edges to the nearest hard development. The only exception is where access roads and cabling need to cross such drainage lines.
- No trenches (for cables, etc.) should be left open for more than three days, as they are effective pitfall traps for various small animals.

Operational Phase

- The applicant must ensure that alien invasive vegetation on site is controlled and removed throughout the operational lifespan of the project. No additional planting should be allowed anywhere on site, unless with suitable, locally indigenous plant species.
- The applicant must ensure that erosion on the site is minimised and managed.

Decommissioning Phase

If the facility is to be removed the following rehabilitation is recommended:

- Once all infrastructure has been removed the panel areas should be ripped to a depth of no more than 10cm, along the contours. The security fences should be kept in place to prevent grazing in these areas for at least three years, and can then be removed.
- Alien invasive vegetation management should be undertaken on the site once a year for at least three years after decommissioning.
- Removal of underground electrical cabling will cause significantly more disturbance than just leaving it there (recommended), but presumably it will be necessary to remove it. If removed they trenches should be infilled immediately.

11. CONCLUSIONS

- The study area presents a viable opportunity for the development of the proposed photovoltaic solar energy facility, provided that it is located primarily (>95%) within the identified areas of Low and Medium ecological sensitivity, and does not intrude significantly onto the drainage lines and associated required buffers.
- Overall botanical impacts are likely to be Medium negative, before and after mitigation.
- Overall faunal impacts are likely to be Low to Medium negative, before and after mitigation.

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APPENDIX 1 - List of Mammals

A list of mammals which are known to occur and are likely to occur in the vicinity of the Klipdam PV Facility. Habitat notes and distribution records are based on Skinner & Chimimba (2005), while conservation status is from the IUCN Red Lists 2012. IUCN-listed species are highlighted.

Scientific Name	Common Name	Status	Habitat	Probability
Golden Moles:				
Chrysochloris asiatica	Cape Golden Mole	LC	Coastal parts of the Northern and Western Cape	Low
Elephant Shrews:				
Macroscelides proboscideus	Round-eared Elephant Shrew	LC	Open country, with shrubs and sparse grass cover, also occurs on gravelly and sandy plains with sparse boulders	High
Elephantulus rupestris	Western Rock Elephant Shrew	LC	Rocky koppies or piles of boulders	High
Elephantulus edwardii	Cape Rock Elephant Shrew	LC	Usually in rocky areas	High
Aardvark:				
Orycteropus afer	**Aardvark**	LC	Widespread; often associated with sandy soil	Burrows observed
Hyrax:				
Procavia capensis	**Rock Hyrax**	LC	Rocky outcrops, esp. granite hills, and dolerite koppies in the Karoo	Observed
Hares and Rabbits:				
Pronolagus rupestris	**Smith's Red Rock Rabbit**	LC	Rocky hillsides	Observed
Lepus capensis	**Cape Hare**	LC	Dry, open regions, with palatable bush and grass	Observed
Lepus saxatilis	Scrub Hare	LC	Usually in more disturbed areas than Cape hare	High
Rodents:				
Bathyergus janetta	Namaqua Dune Mole Rat	LC	Sandy substrates along the coast or inland; regional endemic	Low
Cryptomys hottentotus	**African Mole Rat**	LC	Wide diversity of habitats	Observed
Hystrix africaeaustralis	**Cape Porcupine**	LC	Wide diversity of habitats	Scat observed
Petromus typicus	**Dassie Rat**	LC	Mountainous regions and inselbergs, where they are confined to rocky outcrops and live in crevices or piles of boulders	Observed
Xerus inauris	South African Ground Squirrel	LC	Open terrain with a sparse bush cover and a hard substrate	High
Graphiurus ocularis	Spectacled Dormouse	LC	Rocks and trees	High
Graphiurus platyops	Rock Dormouse	LC	Rocky terrain, under the exfoliation plates on granite, and in piles of boulders	High
Rhabdomys pumilio	Four-striped Mouse	LC	Occurs in wide variety of habitats where there is good cover	High
Mus minutoides	Pygmy Mouse	LC	Wide habitat tolerance	High
Aethomys namaquensis	**Namaqua Rock Mouse**	LC	Catholic in their habitat requirements, but prefer rocky koppies	Observed
Parotomys brantsii	**Brants's Whistling Rat**	LC	Dry, sandy substrates in arid parts of the Nama and Succulent Karoo. Selects	Observed

			areas of low plant cover and deep sands.	
Parotomys littledalei	Littledale's Whistling Rat	LC	Riverine alluvium, with *Lycium* or *Psilocaulon*	Moderate
Otomys unisulcatus	**Bush Vlei Rat**	LC	Shrubby areas with rocky outcrops	Observed
Desmodillus auricularis	Cape Short-tailed Gerbil	LC	Usually on hard ground, unlike other gerbils, with some cover of grass or karroid bush	High
Gerbillurus paeba	Hairy-footed Gerbil	LC	Widespread; preferring sandy soil or alluvium with a grass, scrub or light woodland cover	High
Gerbilliscus leucogaster	Bushveld Gerbil	LC	Predominantly associated with light sandy soils or sandy alluvium	Low
Malacothrix typica	Gerbil Mouse	LC	Arid areas with short grass and hard substrate	High
Petromyscus collinus	Pygmy Rock Mouse	LC	Arid areas on rocky outcrops	High
Petromyscus barbouri	Barbour's Rock Mouse	LC	Rocky areas	High
Primates:				
Papio ursinus	Chacma Baboon	LC	Widespread, simply need water and access to refuges	High
Shrews:				
Suncus varilla	Lesser Dwarf Shrew	LC	Often associated with termitaria, little else known	High
Crocidura cyanea	Reddish-Grey Musk Shrew	LC	Arid areas, often in association with scrub and rocks.	High
Carnivores:				
Proteles cristata	Aardwolf	LC	Common in the 100-600mm rainfall range of country, widespread	Moderate
Caracal caracal	Caracal	LC	Widespread, variable	Moderate
Felis silvestris	African Wild Cat	LC	Wide habitat tolerance; often arid	High
Panthera pardus	Leopard	NT	Wide habitat tolerance, often associated with rocky koppies or woodland	Low
Felis nigripes	Black-footed cat	VU	Arid areas with some cover	Low
Genetta genetta	Small-spotted genet	LC	Widespread, often in woodland	High
Suricata suricatta	Meerkat	LC	Open arid country where substrate is hard and stony.	High
Cynictis penicillata	**Yellow Mongoose**	LC	Semi-arid country on a sandy substrate	Observed
Herpestes pulverulentus	Cape Grey Mongoose	LC	Wide habitat tolerance, usually with denser cover	High
Vulpes chama	Cape Fox	LC	Associated with open country with low cover	Moderate
Canis mesomelas	Black-backed Jackal	LC	Wide habitat tolerance, more common in drier areas.	High
Otocyon megalotis	Bat-eared Fox	LC	Open country with mean annual rainfall of 100-600 mm	Moderate
Ictonyx striatus	Striped Polecat	LC	Widely distributed throughout the sub-region	High

Mellivora capensis	Ratel/Honey Badger	LC	Catholic habitat requirements	Moderate
Antelope:				
Sylvicapra grimmia	Common Duiker	LC	Presence of bushes is essential	Low
Raphicerus campestris	**Steenbok**	LC	Inhabits open country,	Scat observed
Oreotragus oreotragus	Klipspringer	LC	Closely confined to rocky habitat.	Moderate
Bats:				
Rousettus aegyptiacus	Egyptian Rousette	LC	Require fruit and caves for roosting in the vicinity	Moderate
Pipistrellus capensis	Cape Serotine Bat	LC	Wide habitat tolerances, but often found near open water	High
Tadarida aegyptiaca	Egyptian Free-tailed Bat	LC	In arid areas, often associated with water sources	High
Nycteris thebaica	Egyptian Slit-faced Bat	LC	Wide habitat tolerance	High
Miniopterus natalensis	Schreibers' long-fingered bat	NT	Suitable caves are an essential habitat requirement	Moderate
Cistugo seabrae	Angolan hairy bat	LC	Areas with annual rainfall of less than 100 mm, often in dry riverbeds	High
Eptesicus hottentotus	Long-tailed serotine bat	LC	Wide habitat tolerance	Moderate
Rhinolophus capensis	Cape horseshoe bat	LC	Roosts in caves and mine adits	High
Rhinolophus clivosus	Geoffroy's horsehoe bat	LC	Wide habitat tolerance but roost in caves and adits	High
Rhinolophus darlingi	Darling's horseshoe bat	LC	Wide habitat tolerance but roost in caves and adits	Moderate
Sauromys petrophilus	Roberts's flat headed bat	LC	Widespread; roosts in rock crevices	Moderate

Appendix 2 - List of Reptiles

A list of reptiles which may occur in the proposed Klipdam PV facility study area. Habitat notes and distribution records are based on Alexander and Marais (2007), while conservation status is from Bates *et al* (in press).

Scientific Name	Common Name	Distribution	Status	Habitat	Probability
Tortoises and Terrapins:					
Homopus signatus	Speckled Padloper	Endemic	VU	Ridges and stony areas, often on plateaus and ridges	High
Chersina angulata	Angulate Tortoise	Endemic	LC	Sandy coastal regions, incl valley bushveld & coastal fynbos, scarcer in arid hinterland	High
Psammobates tentorius trimeni	Tent Tortoise	Endemic	LC	Varied: usually arid karroid areas or rocky sandveld	High
Snakes:					
Rhinotyphlops lalandei	Delalande's Beaked Blind Snake	Endemic	LC	Varied: semi-desert, coastal bush, fynbos & savannah	High
Rhinotyphlops schinzi	Schinz's Beaked Blind Snake	Endemic	LC	Semi-deseet and arid savanna	High
Lamprophis capensis	Brown House Snake	Widespread	LC	Common in highveld grassland & arid karroid regions, but found everywhere & tolerant of urban sprawl	High
Lamprophis guttatus	Spotted Rock Snake	Endemic	LC	Inland mnts of Cape & Cape fold mnts, extending into S.Namibia	Low
Lamprophis fiskii	Fisk's House Snake	Endemic	VU	Karroid sandy veld, but few specimens from widely scattered localities	Low
Pseudaspis cana	Mole Snake	Widespread	LC	Sandy scrubland in SW Cape, highveld grassland & mountainous & desert regions	High
Philothamnus semivariegatus	Spotted Bush Snake	Widespread	LC	River banks, shrubs or rocky regions in karoo scrub. Also savanna and lowland forest.	High
Prosymna frontalis	South-western Shovel-Snout	Widespread	LC	Rocky areas in arid regions	High
Dipsina multimaculata	Dwarf Beaked Snake	Endemic	LC	Rocky, sandy areas. Cape karroid areas.	High
Psammophylax rhombeatus	Spotted Or Rhombic Skaapsteker	Widespread	LC	Highland grassveld & fynbos, entering karroid areas	High
Psammophis notostictus	Karoo Sand or Whip Snake	Widespread	LC	Arid scrubland & karroid regions	High
Psammophis leightoni	Cape Whip Snake	Endemic	VU	Coastal fynbos, desert and semi-desert	High
Dasypeltis scabra	Common/Rhombic Egg Eater	Widespread	LC	Absent only from true desert & closed-canopy forest	High
Telescopus beetzii	Namib Tiger Snake	Endemic	LC	Rocky, arid regions	High
Aspidelaps lubricus	Coral Shield Cobra	Widespread	LC	Karroid & sandveld regions, entering dry valley plains in S and E Cape	High
Naja nivea	Cape Cobra	Endemic	LC	Arid karroid regions, particularly along river courses, entering well drained open areas along the southern coast	High
Naja nigricollis woodi	Black Spitting Cobra	Endemic	LC	Namibia to Citrusdal in karroid scrub	High
Hemachatus haemachatus	Rinkhals	Endemic	LC	Grassland from the coast up to 2500 m	High
Bitis arietans	Puff Adder	Widespread	LC	Absent only from desert & mnt	High

				tops	
Bitis cornuta	Many-horned Adder	Endemic	LC	Mountainous regions, rocky outcrops, gravel plains and mountain fynbos	High
Bitis caudalis	Horned Adder	Widespread	LC	Sandy regions, throughout Karoo	High
Lizard and Skinks:					
Acontias gracilicauda namaquensis	Thin-tailed Legless Skink	Endemic	LC	Valley bushveld, grassland entering sandy regions	High
Acontias lineatus	Striped Legless Skink	Endemic	LC	Sandy, arid soils	High
Scelotes sexlineatus	Striped Dwarf Burrowing Skink	Endemic	LC	Succulent Veld	Low
Scelotes capensis	Western Dwarf Burrowing Skink	Endemic	LC	Leaf litter and friable sand	High
Mabuya capensis	Cape Skink	Widespread	LC	Very varied: arid karroid veld, moist coastal bush, montane grassland, etc	High
Mabuya occidentalis	Western Three-Striped Skink	Widespread	LC	Arid Savanna karroid veld and desert	High
Mabuya sulcata	Western Rock Skink	Widespread	LC	Karroid areas	Observed
Mabuya variegata	Variegated Skink	Widespread	LC	Extremely varied; desert, karroid veld, montane grassland, savanna, coastal bush & valley bushveld	Observed
Meroles suborbitalis	Spotted Desert Lizard	Endemic	LC	Varied, arid savanna to desert	Observed
Nucras tessellata tessellata	Striped Sandveld Lizard	Widespread	LC	Open arid savannah & karroid veld	High
Pedioplanis laticeps	Cape Sand Lizard	Endemic	LC	Coastal dunes and succulent karroid veld	High
Pedioplanis lineoocellata	Spotted Sand Lizard	Endemic	LC	Very varied: karroid veld, valley bushveld & arid & mesic savannah	Observed
Pedioplanis namaquensis	Namaqua Sand Lizard	Widespread	LC	Karroid veld	High
Pedioplanis inornata	Plain Sand Lizard	Endemic	LC	Bedrock flats in semi-desert	High
Cordylosaurus subtessellatus	Dwarf Plated Lizerd	Endemic	LC	Sandy areas among rocks	High
Gerrhosaurus typicus	Namaqua Plated Lizard	Endemic	LC	Karroid succulent veld	High
Cordylus peersi	Peers Girdled Lizard	Narrow Endemic	LC	Rocky outcrops in succulent karroid veld	High
Cordylus polyzonus	Karoo Girdled Lizard	Endemic	LC	Karroid regions	High
Cordylus cataphractus	Armadillo Girdled Lizard	Endemic	LC	Rock outcrops and mountain ranges	High
Agama atra	Southern Rock Agama	Endemic	LC	Semi-desert to fynbos, from sea level to mountain tops	High
Agama hispida	Southern Spiny Agama	Endemic	LC	Arid semi-desert, coastal dunes & salt pans	Low
Chameleons:					
Chamaeleo namaquensis	Namaqua Chameleon	Widespread	LC	Sandy regions (incl coastal dunes) with scrub vegetation	High
Geckos:					
Afroedura africana	African Flat Gecko	Endemic	LC	Rocky desert and succulent karroid veld	High
Chondrodactylus angulifer	Giant Ground Gecko	Endemic	LC	Gravel plains, interdune spaces & sandy flats	High
Chondrodactylus bibronii	Bibron's Tubercled Gecko	Endemic	LC	Rocky outcrops, cliffs and large trees	High
Pachydactylus labialis	Western Cape Thick-toed Gecko	Endemic	LC	Succulent karroid veld	High
Pachydactylus namaquensis	Namaqua Thick-toed Gecko	Narrow Endemic	LC	Karroid succulent veld	High
Pachydactylus	Marico Thick-toed	Endemic	LC	Flat sandy plains with sparse	High

mariquensis	Gecko			vegetation	
Pachydactylus weberi	Weber's Thick-toed Gecko	Endemic	LC	Succulent karroid veld	High
Phelsuma ocellata	Namaqua Day Gecko	Endemic	LC	Boulder strewn hillsides and rocky outcrops	Moderate
Pachydactylus rugosus	Rough Thick-toed Gecko	Endemic	LC	Semi-desert and succulent karroid veld	High
Ptenopus garrulus	Common Barking Gecko	Endemic	LC	Desert and semi-desert on various soil types, preferring flat stable sandy soils with sparse vegetation cover	High
Goggia rupicola	Namaqua Leaf-toed Gecko	Endemic	LC	Rocky areas in Namaqualand	High
Goggia lineata	Striped Leaf-Toed Gecko	Endemic	LC	Coastal fynbos, succulent & transitional karroid veld, montane grassland	High

Appendix 3 – List of Amphibians

A list of amphibians which may occur within the proposed Klipdam PV facility study area. Habitat notes and distribution records are based on Minter *et al* (2004), while conservation status is from Measy (2011).

Scientific Name	Common Name	Status	Habitat	Likelihood
Vandijkophrynus gariepensis	Karoo Toad	Least Threatened	Widespread and varied	High
Vandijkophrynus robinsoni	Paradise Toad	Least Threatened	Most waterbodies in the greater Namakwaland region	Low
Xenopus laevis	Common Platanna	Least Threatened	Any more or less permanent water	Very Low
Amietia fuscigula	Cape River Frog	Least Threatened	Large still bodies of water or permanent streams and rivers.	Very Low
Cacosternum namaquense	Namaqua Caco	Least Threatened	Rocky granite outcrops, and breeds in temporary or permanent natural or man-made pools	High
Strongylopus springbokensis	Namaqua Stream Frog	Least Threatened	Mountainous areas of Namaqualand associated with seeps and springs	Low
Tomopterna delalandii	Cape Sand Frog	Least Threatened	Widespread in Fynbos and Succulent Karoo; breeds in shallow, often seasonal water	Medium

Appendix 4 - List of Birds

A list of birds which were observed or which are likely to occur in and around the Klipdam PV study area, based on personal observation **(bold**) and 52 cards from SABAP 2 as well as SABAP1. Listed according to the SABAP reporting rate.

Rank	Common name	Scientific name	Status	Reporting rate
1	**Cape Bunting**	*Emberiza capensis*		92.3
2	**Bokmakierie**	*Telophorus zeylonus*		92.3
3	**Cape Sparrow**	*Passer melanurus*		90.4
4	**Common Fiscal**	*Lanius collaris*		88.5
5	Mountain Wheatear	*Oenanthe monticola*		82.7
6	**Pied Crow**	*Corvus albus*		82.7
7	Rock Martin	*Hirundo fuligula*		80.8
8	**Karoo Prinia**	*Prinia maculosa*		78.8
9	Cape Turtle-Dove	*Streptopelia capicola*		76.9
10	White-backed Mousebird	*Colius colius*		76.9
11	Speckled Pigeon	*Columba guinea*		75.0
12	Cape Weaver	*Ploceus capensis*		73.1
13	White-throated Canary	*Crithagra albogularis*		73.1
14	Anteating Chat	*Myrmecocichla formicivora*		71.2
15	**Pale-winged Starling**	*Onychognathus nabouroup*		67.3
16	Jackal Buzzard	*Buteo rufofuscus*		67.3
17	**Karoo Scrub-Robin**	*Cercotrichas coryphoeus*		63.5
18	Laughing Dove	*Streptopelia senegalensis*		63.5
19	**Dusky Sunbird**	*Cinnyris fuscus*		59.6
20	Karoo Chat	*Cercomela schlegelii*		55.8
21	Grey-backed Cisticola	*Cisticola subruficapilla*		55.8
22	Southern Masked-Weaver	*Ploceus velatus*		53.8
23	**Acacia Pied Barbet**	*Tricholaema leucomelas*		51.9
24	Large-billed Lark	*Galerida magnirostris*		51.9
25	**Layard's Tit-Babbler**	*Parisoma layardi*		50.0
26	Cape Glossy Starling	*Lamprotornis nitens*		48.1
27	**Malachite Sunbird**	*Nectarinia famosa*		48.1
28	Familiar Chat	*Cercomela familiaris*		46.2
29	Cape Wagtail	*Motacilla capensis*		44.2
30	Southern Double-collared Sunbird	*Cinnyris chalybeus*		44.2
31	Capped Wheatear	*Oenanthe pileata*		44.2
32	**Karoo Lark**	*Calendulauda albescens*		44.2
33	**Rock Kestrel**	*Falco rupicolus*		42.3
34	Grey Tit	*Parus afer*		40.4
35	Karoo Eremomela	*Eremomela gregalis*		40.4
36	African Red-eyed Bulbul	*Pycnonotus nigricans*		36.5
37	Southern Pale Chanting Goshawk	*Melierax canorus*		36.5
38	Cape Bulbul	*Pycnonotus capensis*		34.6
39	Little Swift	*Apus affinis*		34.6
40	**Rufous-eared Warbler**	*Malcorus pectoralis*		32.7
41	Yellow Canary	*Crithagra flaviventris*		32.7
42	House Sparrow	*Passer domesticus*		32.7
43	Karoo Thrush	*Turdus smithi*		30.8
44	Verreaux's Eagle	*Aquila verreauxii*		30.8
45	Red-capped Lark	*Calandrella cinerea*		30.8

46	Black-headed Canary	*Serinus alario*		30.8
47	Cinnamon-breasted Warbler	*Euryptila subcinnamomea*		28.8
48	Orange River White-eye	*Zosterops pallidus*		26.9
49	Cape Robin-Chat	*Cossypha caffra*		25.0
50	**Namaqua Sandgrouse**	*Pterocles namaqua*		25.0
51	African Sacred Ibis	*Threskiornis aethiopicus*		23.1
52	**Long-billed Crombec**	*Sylvietta rufescens*		23.1
53	Spike-heeled Lark	*Chersomanes albofasciata*		21.2
54	South African Shelduck	*Tadorna cana*		21.2
55	Blacksmith Lapwing	*Vanellus armatus*		21.2
56	Lark-like Bunting	*Emberiza impetuani*		21.2
57	Fairy Flycatcher	*Stenostira scita*		19.2
58	Red-eyed Dove	*Streptopelia semitorquata*		17.3
59	Egyptian Goose	*Alopochen aegyptiacus*		17.3
60	Red-knobbed Coot	*Fulica cristata*		17.3
61	Long-billed Pipit	*Anthus similis*		17.3
62	Black Harrier	*Circus maurus*	NT	17.3
63	Namaqua Warbler	*Phragmacia substriata*		15.4
64	European Bee-eater	*Merops apiaster*		15.4
65	Brown-throated Martin	*Riparia paludicola*		15.4
66	Tractrac Chat	*Cercomela tractrac*		15.4
67	Three-banded Plover	*Charadrius tricollaris*		13.5
68	Common Ostrich	*Struthio camelus*		13.5
69	Little Grebe	*Tachybaptus ruficollis*		13.5
70	Pririt Batis	*Batis pririt*		11.5
71	**Namaqua Dove**	*Oena capensis*		11.5
72	Common Waxbill	*Estrilda astrild*		11.5
73	Booted Eagle	*Aquila pennatus*		11.5
74	Spotted Eagle-Owl	*Bubo africanus*		11.5
75	Greater Kestrel	*Falco rupicoloides*		11.5
76	Rock Dove	*Columba livia*		9.6
77	Cattle Egret	*Bubulcus ibis*		9.6
78	Hadeda Ibis	*Bostrychia hagedash*		7.7
79	Grey-backed Sparrowlark	*Eremopterix verticalis*		7.7
80	Ludwig's Bustard	*Neotis ludwigii*	VU	7.7
81	Yellow-billed Duck	*Anas undulata*		7.7
82	African Hoopoe	*Upupa africana*		7.7
83	Ground Woodpecker	*Geocolaptes olivaceus*		7.7
84	Cape Crow	*Corvus capensis*		7.7
85	Chestnut-vented Tit-Babbler	*Parisoma subcaeruleum*		5.8
86	Cape Penduline-Tit	*Anthoscopus minutus*		5.8
87	Southern Red Bishop	*Euplectes orix*		5.8
88	Black-eared Sparrowlark	*Eremopterix australis*		5.8
89	Chat Flycatcher	*Bradornis infuscatus*		5.8
90	Red-faced Mousebird	*Urocolius indicus*		5.8
91	Barn Swallow	*Hirundo rustica*		5.8
92	Cape Teal	*Anas capensis*		5.8
93	Karoo Long-billed Lark	*Certhilauda subcoronata*		5.8
94	African Pipit	*Anthus cinnamomeus*		5.8
95	Black-headed Heron	*Ardea melanocephala*		5.8
96	**Cape Clapper Lark**	*Mirafra apiata*		5.8
97	Lanner Falcon	*Falco biarmicus*	NT	5.8
98	Alpine Swift	*Tachymarptis melba*		5.8

99	Common Quail	*Coturnix coturnix*		3.8
100	Speckled Mousebird	*Colius striatus*		3.8
101	Mallard Duck	*Anas platyrhynchos*		3.8
102	Helmeted Guineafowl	*Numida meleagris*		3.8
104	Black-shouldered Kite	*Elanus caeruleus*		3.8
105	Yellow Bishop	*Euplectes capensis*		3.8
106	Yellow-bellied Eremomela	*Eremomela icteropygialis*		3.8
107	Pied Starling	*Spreo bicolor*		3.8
108	Martial Eagle	*Polemaetus bellicosus*	VU	3.8
109	Cape Long-billed Lark	*Certhilauda curvirostris*		3.8
110	Grey Heron	*Ardea cinerea*		3.8
111	Black-winged Stilt	*Himantopus himantopus*		3.8
112	Spotted Thick-knee	*Burhinus capensis*		3.8
113	Cape Spurfowl	*Pternistis capensis*		1.9
114	White-necked Raven	*Corvus albicollis*		1.9
115	Common Starling	*Sturnus vulgaris*		1.9
116	African Palm-Swift	*Cypsiurus parvus*		1.9
117	Wattled Starling	*Creatophora cinerea*		1.9
118	Yellow-billed Kite	*Milvus aegyptius*		1.9
119	Cape Shoveler	*Anas smithii*		1.9
120	African Reed-Warbler	*Acrocephalus baeticatus*		1.9
121	Cape White-eye	*Zosterops virens*		1.9
122	Cape Eagle-Owl	*Bubo capensis*		1.9
123	Black-throated Canary	*Crithagra atrogularis*		1.9
124	White-throated Swallow	*Hirundo albigularis*		1.9
125	Pied Avocet	*Recurvirostra avosetta*		1.9
126	Maccoa Duck	*Oxyura maccoa*		1.9
127	Freckled Nightjar	*Caprimulgus tristigma*		1.9
128	Secretarybird	*Sagittarius serpentarius*	NT	1.9
129	White-rumped Swift	*Apus caffer*		1.9
130	African Harrier-Hawk	*Polyboroides typus*		1.9
131	Sickle-winged Chat	*Cercomela sinuata*		1.9

APPENDIX D3 – SPECIALIST VISUAL IMPACT REPORT

2nd Consultative Draft

PROPOSED MELKBOSKUIL PHOTOVOLTAIC SOLAR ENERGY FACILITY

Portion 26 of the Farm Melkboschkuil No. 132, Springbok,

Northern Cape Province

DEA Ref. 14/12/16/3/3/1/974

VISUAL IMPACT ASSESSMENT

Prepared as part of an Environmental Impact Assessment Process undertaken in terms of the National Environmental Management Act, 107 of 1998

11NOVEMBER 2013

PROJECT NO: VIA_120613.FE

Produced for:

NK Energie (Pty) Ltd.

On behalf of:

Footprint Environmental Services

Produced by:

ZONE LAND SOLUTIONS

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1 INTRODUCTION

1.1 Background and Purpose of Report

NK Energie (Pty) Ltd. proposes to establish a commercial photovoltaic (PV) solar energy facility as well as associated infrastructure on a site approximately 8km north-east of Springbok in the Northern Cape Province. The project would be developed as a single phase and the completed solar energy facility will be able to generate 20MW.

This Visual Impact Assessment (VIA) is undertaken as part of the Environmental Impact Assessment (EIA) process being facilitated by Footprint Environmental Services, in terms of the National Environmental Management Act 107 of 1998 (NEMA). As such, the purpose of this report is to assess the proposed activity for the site(s) in terms of the *Guidelines for Involving Visual and Aesthetic Specialists in the EIA Process* and the *NEMA EIA Regulations of 2010*.

1.2 Components of the Report

The aspects addressed in this report are as follows:

a) Description of the methodology adopted in preparing the report.
b) Description of the receiving environment.
c) Description of the view catchment area, view corridors, viewpoints and receptors.
d) Identification and evaluation of potential visual impacts associated with the proposed activity and the alternatives identified, by using the established criteria, including potential lighting impacts at night.
e) Identification in terms of best practical environmental option in terms of visual impact.
f) Addressing of additional issues such as:
    - Impact on skyline.
    - Negative visual impact.
    - Impact on aesthetic quality and character of place.
g) Assumptions made and uncertainties or gaps in knowledge.
h) Recommendations in respect of mitigation measures that should be considered by the applicant and competent authority.

1.3 Study Methodology

As stated previously, this VIA was undertaken in accordance with the *Guideline for Involving Visual and Aesthetic Specialists in EIA Processes*, as issued by the Western Cape Government's Department of Environmental Affairs and Development Planning during 2005[1].

[1] No similar policy exists for the Northern Cape Province. However, the Guidelines are based upon universally accepted principles and are therefore applicable to the said project.

The VIA was undertaken in distinct steps, each of which informed the subsequent steps. The figure below summarises the methodology adopted for undertaking the assessment.

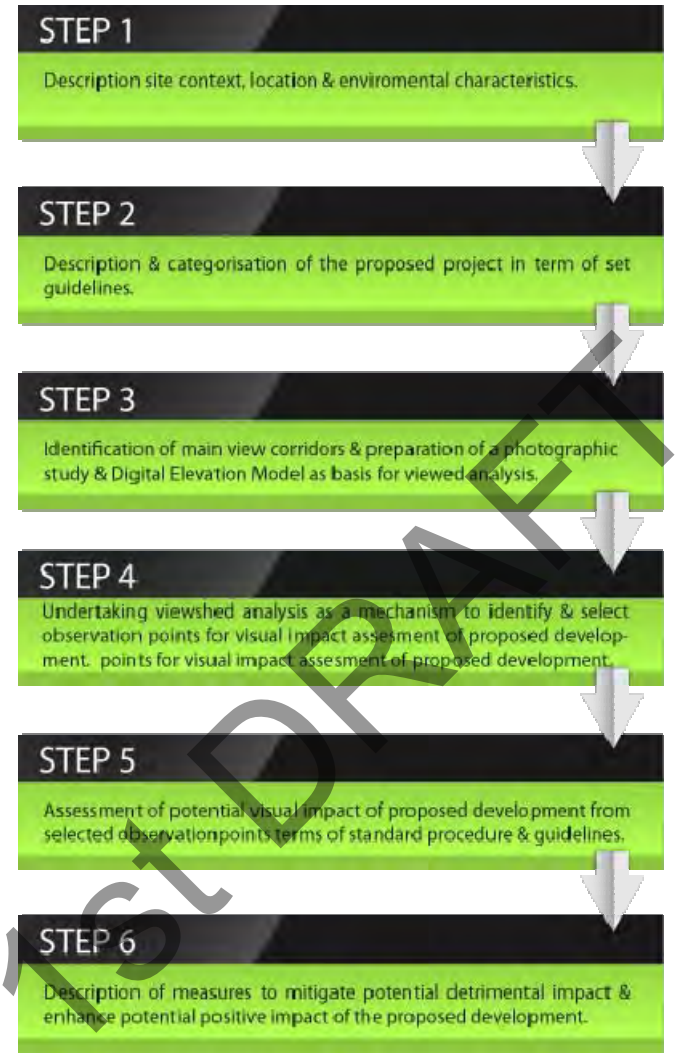

Figure 1: Methodology adopted for the VIA.

1.4 Supplementary Documentation

This report is to be read together with Annexure 2 (Selected observation point viewsheds and assessments), which provides an identification of selected observation points and visual assessment of the proposed activity from each of these points.

1.5 Gaps in Knowledge, Assumptions and Limitations

This assessment was undertaken during the planning stage of the project and is based on the information and Terms of Reference provided by Footprint environmental Services on 7 August 2013, for the mentioned project.

Assessments of this nature generally suffer from a number of defects that must be acknowledged:

- **Limited time:** A comprehensive assessment requires a systematic assessment of the environment at different times of day and at different times of the year. Such luxury is not always possible and therefore most assessments are based on observations made at a specific time of day. Educated estimates are made, where applicable, based on the knowledge of the area.
- **Availability of literature:** A thorough assessment requires that all relevant literature on the subject matter is studied, acknowledged and incorporated in the report. Due to a range of factors, forward planning documents are not always available for all spheres of government.

Notwithstanding the above, it is believed that this assessment identified all issues of likely importance from a visual point of view.

2 THE AFFECTED ENVIRONMENT

2.1 Locality

The project site is located in the NamaKhoi Local Municipality (NC062) in the Namakwa District Municipality in the Northern Cape Province, and is some 8km north-east of the district town of Springbok via the N14.

Although Springbok is regarded as a rural settlement in context of the Northern Cape, it is the administrative capital of the NamaKhoi Municipality and is the largest town in the Namaqualand district in the Northern Cape Province. Springbok is surrounded by several smaller settlements that primarily originated as mining settlements. One of these settlements is Carolusberg, which borders the project site to the west. Other rural settlements include Nababeep (some 17km to the north-west of Carolusberg), Okiep (at 8km north-west of Carolusberg) and Concordia some 10km north of Carolusberg.

The Goegap Nature Reserve borders the subject property immediately to the north and east.

Figure 2: Regional context of the subject property.

The town of Carolusberg originated as a mining settlement for workers on the nearby Copper Mine of similar name. The mine was formally proclaimed as a Grade II National Monument and duly promulgated and published in the Provincial Gazette on 24 April 1959. The piece of land upon which the mine is situated, was owned by the O'okiep Copper Company Limited and contains a mine shaft sunk by Commander Simon van der Stel on an expedition to the Copper Mountains in 1685.

The early settlement of Springbok originated as a major commercial and administrative centre for copper mining operations in the region. Even though mining activities have dwindled, the town remains an important administrative capital in the region and due to its location a favourite stopover for tourists on their way to Namibia. Today the main income is generated from tourism, mining activities, commerce and farming (http://en.wikipedia.org/wiki/Springbok_Northern_Cape).

The Northern Cape Provincial Spatial Development Framework (2012) described the economic base of Carolusberg as being dependent on mining. The downscaling of this sector in the Carolusberg and the other mining-dependent settlements in the region over the past years not only resulted in job losses which impact negatively on families, but emphasises the need for further diversification of the economy (PSDF, 2012).

Figure 3: Nature of the landscape in the vicinity of the project site.

2.1.1 Intrinsic Values of the Namaqualand

It is a common principle of planning that each place has a specific intrinsic, instrumental and systemic value and that such values need to be carefully considered when contemplating the current and future use of any particular place.

Broadly -speaking, two different philosophical perspectives are possible when considering the value of any place or object, namely **what is it good for?** and **what is its own good?** The first question relates to its instrumental value, while the second deals with intrinsic value. Instrumental value uses something as a '*means to an end*' while intrinsic value refers to being '*worthwhile in itself*' (Rolston, 1994).

Systemic value relates to the fact that '*things do not have their separate natures merely in, and for themselves, but they face outward and co-fit into broader natures. Value seeps out into the system and the individual lose its status as sole locus of value*' (Rolston, 1994:174). Systemic value refers to the relations that things have with other things, and to the role they play in larger wholes.

The value system of Namaqualand was determined in the various collaborative, participative processes undertaken during the drafting of forward planning documentation, policy and guidelines. As such, the intrinsic value of the Namaqualand is found in the agrarian landscape with strong linkages to the rural, natural landscape.

As described above, even though the intrinsic value of the Namaqualand is based on the agrarian characteristics, the values of the project site and its surroundings have to a large degree been lost.

2.2 Economic Context

The contributions of the Carolusberg Copper Mine to the present economy of the regional is not well documented, however, the nearby district town of Springbok has a well-developed business and service sector to meet the needs of the farming and surrounding

mining communities. This puts the town in a very suitable position to supply a wide hinterland with higher-order shopping goods and regional services. The range of its services transcends provincial and even international boundaries.

In order to provide a premise for the appropriation of public funds and the investment of private resources, the Northern Cape Provincial Spatial Development Framework (PSDF) provides a summary of the profiles of the municipalities and settlements, as it relates to their economic base (i.e. type of settlement), development potential and human need, and investment type required.

The settlements of the Northern Cape fall within one or more of the following economic base categories:

a) Agriculture centre: Related to traditional service centres are those settlements with a substantial component of agricultural activities within the town structure.
b) Diverse centre: Settlements with a well-established and balanced economic base, incorporating a diversified amalgam of economic functions – such settlements do not rely on only one or two sectors as their economic base.
c) Mining centre: Settlements where mining activities provide the resource base for economic development.
d) Recreational centre: Settlements that offer focussed leisure activities, local natural and cultural recreation opportunities for residents and tourists.
e) Regional centre: Settlements serving several lower-order settlements with higher-order services and goods over a relatively extensive spatial sphere of influence.
f) Residential centre: A dormitory town where people live permanently, but work elsewhere, or are jobless.
g) Service centre: Traditional place settlements serving the daily needs of a surrounding farming community, e.g. providing educational, religious, shopping and professional services.
h) Transportation centre: Settlements where road, rail, air or water activities play a dominant role in their economic functioning.

Table 1: Settlement profile of Carolusberg.

SETTLEMENT	POPULATION	ECONOMIC BASE	POTENTIAL & NEED	INVESTMENT TYPE
Carolusberg	Small	Mining	High Dev / Low Need	Infrastruc.& Basic

2.3 Project Site Description

As illustrated by the figure below, the project site consists of a single property, namely Portion 26 of the Farm Melkboschkuil No. 132. This property is some 362ha in extent, while only approximately 32ha has been made available for the establishment of the proposed activity on four development sites (referred to as A-D on the Figure below).

Depending on the preferred site, routing corridors will be established between the development site and the nearby electrical substation and transmission lines.

The respective development sites are located along the northern and western boundary of the subject property. The latter boundary is only approximately 240m from the eastern-most portions of the Carolusberg settlement. In addition, all the development sites are located in an elevated position, compared to Carolusberg.

It should however be noted that the final position is still to be determined by means of the EIA process to be undertaken.

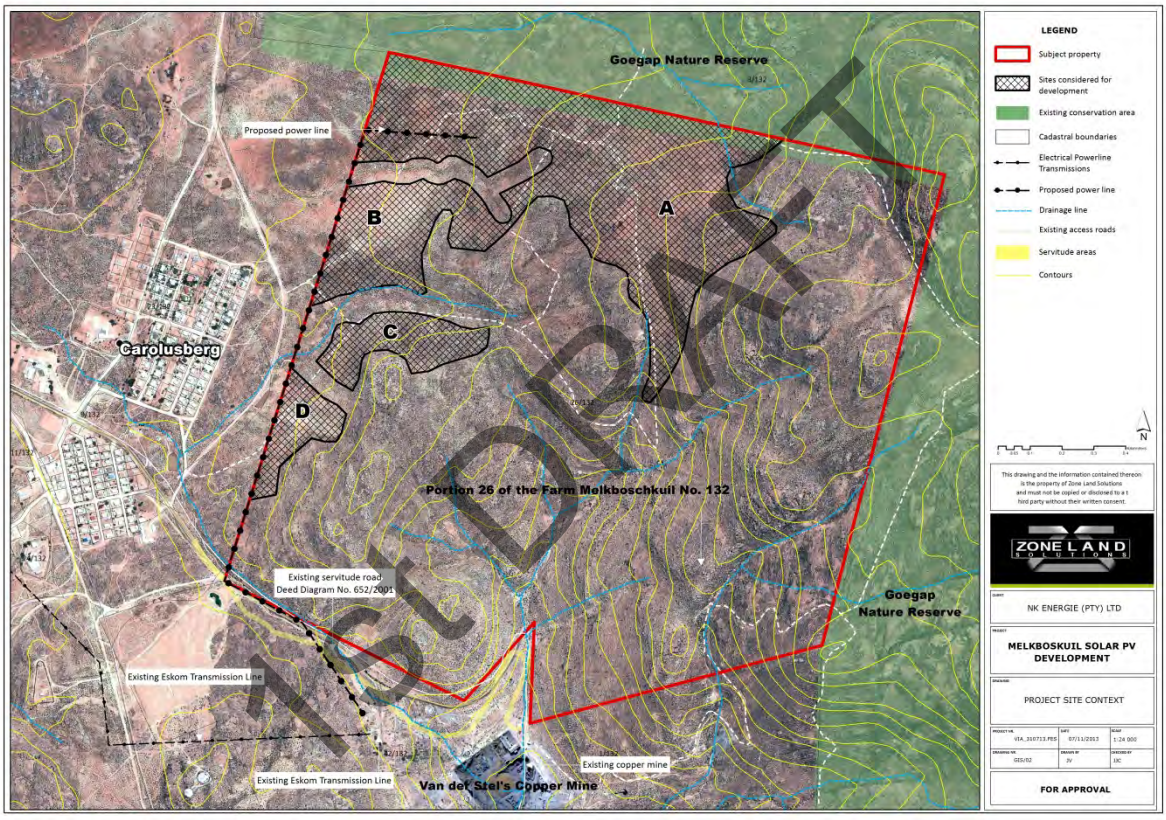

Figure 4: Extent of subject property and location of proposed improvements.

An existing electrical power transmission line between Carolusberg and Okiep connects to the Copper Mine immediately south of the subject property. The electricity generated on site will be evacuated into the electrical grid at the existing electrical substation next to the mine.

2.3.1 Landscape Character

The landscape character of the region typifies that of the Namaqualand. The area is harsh and stony but, soon after the winter rains; the almost lifeless Namakwa is transformed into an exquisite floral display of beauty during spring.

The landscape character of the project site is complex and consists of a rocky mountainous terrain with several 'koppies' and gently-sloping areas in between. Little trees and bushes are present on the site. The subject property is not currently utilised for an intensive land use and has been laying fallow for a considerable period of time. As a result, the subject property displays may similar characteristics to the surrounding Goegap Nature Reserve.

As mentioned above, commercial livestock farming is the main form of farming in the region and the mainstay of the economy.

The Namakwa area experiences severe climatic conditions with rainfall being as low as 106mm per year with most rain occurring during winter. The average midday temperatures range from approximately 16.5°C in June to 28.3°C in January. The region is the coldest during July when the mercury drops to 3.8°C on average during the night.

The area is dominated by Namaqualand Klipkoppe Shrubland (SKn1) and Namakwaland Blomveld (SKn3) vegetation types. According to Mucina and Rutherford (2006), Namaqualand Klipkoppe Shrubland forms part of the Namaqualand Hardeveld group. Namaqualand Klipkoppe Shrubland occurs on the huge granite and gneiss domes, smooth glacis and disintegrating boulder 'koppies' supporting open shrubland, up to 1m tall dominated by shrubs of dwarf to medium stature and with ericoid or succulent leaves. Further landscape features include flat or gently sloping rock sheets that support dwarf or prostate succulents in shallow pockets with soil or in cracks. Fringe vegetation at the bottom of steep rock sheets consist of 1-3 m tall shrubs with non-succulent leaves and canopy cover reaching 40-100%.

Important taxa in this group include Succulent trees: *Aloe dichotoma var. dichotoma* (d). Small trees: *Ficusilicina, Pappea capensis*. Succulent shrubs: *Didelta spinosa* (d), *Euphorbia decussate* (d), E. *mauritanica* (d). Endemic taxa include succulent shrubs such as *Ottosonderia monticola*, *Tylecodon nigricaulis*. Low shrubs: *Lotonosis benthamiana*, *L. longiflora, L quinata, Wiborgia incurvata*, etc.

Namaqualand Klipkoppe Shrubland is least threatened in terms of its conservation status and some 6% is statutorily conserved in the Namaqua National Park, Goegap Nature Reserve and a small portion of the Moedverloren Nature Reserve.

The Namakwaland Blomveld occurs on level to slightly undulating sedimentary surfaces between rocky granitic hills and mountains, such as wide plains and broad valleys with dry channels of intermittent water courses. Sparse dwarf shrubs with succulent or ericoid leaves dominate these shrublands. Geophytes and ephemeral herbs and in places also low, spreading, leaf-succulents show spectacular flower displays (hence the name of the unit) in wet years (Mucina and Rutherford, 2006).

Endemic taxa in this group include herbs such as *Lessertia capitata*, *Lotononis arenicola*; and succulent herbs such as *Dorotheanthus bellidiformis* subsp. *hester-malensis, D rourkei*.

The conservation target for this group is set at 28%. Small portions are statutorily conserved in amongst other Goegap Nature Reserve and Namaqua National Park.

2.3.2 Solar Radiation

The portions of the Northern Cape that border on the Orange River and Namibia have the highest solar radiation intensity in the world (Northern Cape State of the Environment Report, 2005). This translates to an excellent comparative economic advantage for this region and an opportunity to harness the natural sun power and to generate electricity. This positions the NamaKhoi Municipality as an ideal location for the development of concentrated solar power (CSP) and photovoltaic solar power generation technologies.

Figure 5 below illustrates the measured annual direct and diffuse solar radiation of the Northern Cape Province in context of the country as a whole.

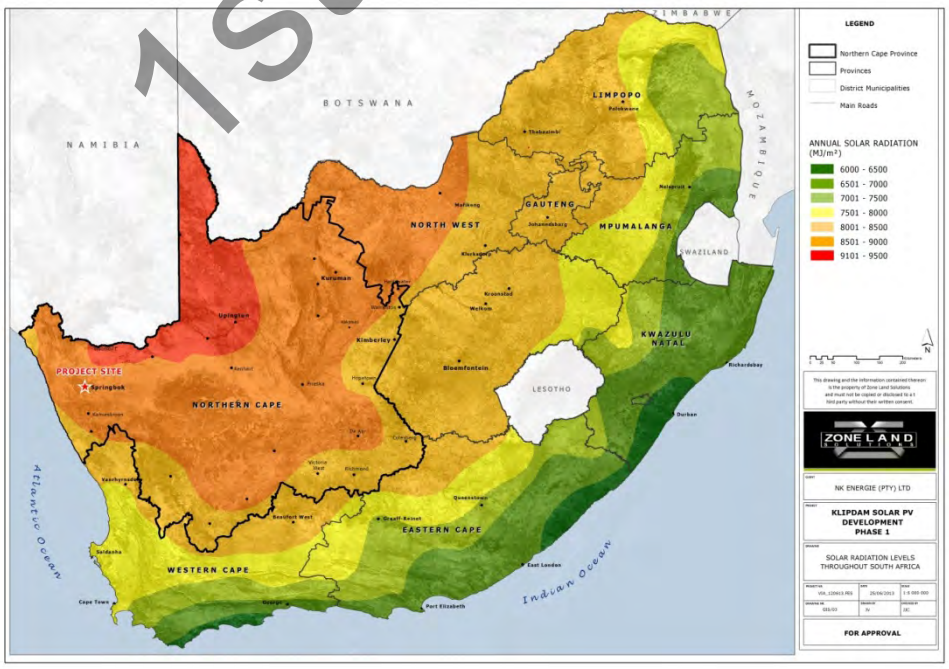

Figure 5: Solar radiation levels for South Africa.

3 PROJECT DESCRIPTION AND INSTALLATIONS

The proposed solar power plant will make use of PV solar panels and associated infrastructure with a total generation capacity of approximately20MW.

The overall aim of the design and layout of the facilities is to maximise electricity production through exposure to the solar radiation, while minimising infrastructure, operation and maintenance costs, as well as possible social and environmental impacts. The use of solar energy for power generation can be described as a non-consumptive use of natural resources which emits zero greenhouse gas emissions.

3.1 Project Components

No details with regard to the physical appearance of the structures have been provided. The description of the photovoltaic plant is based on a generic classification of photovoltaic structures and ancillary infrastructure. The proposed Melkboskuil Solar Energy Facility would however typically comprise of the following infrastructure:

- An array of photovoltaic panels with an installed capacity of up to 20MW;
- Inverter/transformer enclosures;
- Grid connection and 132kV overhead power lines;
- A mounting structure to be either rammed steel piles or piles with pre-manufactured concrete footings to support the PV panels;
- Cabling between the project components, to be lain underground where practical;
- Electrical power lines to be erected en route to the existing electrical substation;
- Internal access roads and fencing; and
- A workshop area for maintenance and storage and offices.

3.2 Renewable Energy Technology Proposed

Various renewable energy technologies are available for electricity generation. Renewable energy technologies offer an alternative to fossil fuels, thereby reducing the amount of CO^2 emissions into the atmosphere.

3.2.1 Photovoltaic Technology

Solar energy facilities, such as those using PV panels use the energy of the sun to generate electricity through a process known as Photovoltaic Effect. This effect refers to photons of light colliding with electrons, and therefore placing the electrons into a higher state of energy to create electricity.

Photovoltaic systems use solar panels to convert sunlight into electricity. The system is made up of one or more solar panels, usually a controller or power converter, and the interconnections and mounting for the other components.

The proposed PV modules will be approximately 1.9 m² (0.99m x 1.96m) in size. Each module will be mounted on a metal supporting structure, no more than 1.8m off the ground. There are a number of options regarding the structure and their anchoring to the ground. Typically this is done by means of a small concrete 'foot' at the base of the pole supporting the structure. This facility will make use of specially designed metal screw that will be screwed into the ground and the support structure will be bolted onto it.

Individual ground-mounted PV panels (also referred to as free-field or stand-alone arrays) will be connected into a 'string' of panels of approximately 3.4m in height. The 'string' will be attached to a steel support structure set at an angle so to receive the maximum amount of solar radiation. The angle of the panel is dependent on the latitude of the proposed facility and the angles may be adjusted to optimise for summer or winter solar radiation characteristics.

The photovoltaic cells to be used consist of a polycrystalline silicone cell which acts as a semiconductor used to produce the photovoltaic effect. Individual PV cells are linked and placed behind a protective glass sheet to form a photovoltaic panel.

The photovoltaic effect produces electricity in direct current. Therefore an inverter must be used to change it to alternating current. The PV panels are designed to operate continuously for more than 20 years, unattended and with low maintenance.

Figure 6: Illustration of typical photovoltaic panels.

3.3 Potential 'triggers' or Key Issues

A 'trigger' is a characteristic of either the receiving environment or the proposed project which indicates that visibility and aesthetics are likely to be key issues and may require further specialist involvement (DEA&DP, 2005).

The 'triggers', as it relates to the proposed project refer to the following:

Table 2: Potential triggers.

KEY ISSUE	FOCAL POINTS	DESCRIPTION
a) Nature of the receiving environment:	*Areas with protection status, such as nature reserves of national parks.*	The project site does not fall within a conservation area, however, due to the proximity of the Goegap Nature Reserve, the assessment will take this into consideration.
	Proclaimed heritage sites or scenic routes.	The proposed activity is situated near Van der Stel's Copper Mine, which is a declared National Monument.
	Areas lying outside a defined urban edge line.	The proposed activity is situated outside the demarcated urban edge of the nearest town and will be assessed accordingly.
	Areas of important tourism or recreation value.	Although not a primary tourist route, the N14 is an important distribution road between Springbok in the east and Upington and Johannesburg to the east.
	Areas with important vistas or scenic corridors.	The subject property is characterised by several prominent hills and mountains. The impact of the proposed activity on these landforms will be assessed.
b) Nature of the project:	*A change in land use from the prevailing use.*	The prevailing use will change on approximately 32ha. Should the proposed mitigation measures be implemented, the prevailing use could be retained to a degree.
	A significant change to the townscape or streetscape.	The proposed activity will form an integral part of the future landscape character. The extent and significance of a possible visual impact is to be determined through this VIA.
	Possible visual intrusion in the landscape.	The proposed activity will form an integral part of the future landscape character. The extent and significance of a possible visual impact is to be determined through this VIA.

3.4 Development Category

Based upon the 'triggers' and key issues and the environmental context summarised above, the proposed activity is categorised as a **Category 4 Development**.

This categorisation is based upon the *Guidelines for Involving Visual and Aesthetic Specialists in EIA Processes*, which lists the following categories of development:

Box 3: KEY TO CATEGORIES OF DEVELOPMENT

Category 1 Development: e.g. nature reserves, nature-related recreation, camping, picnicking, trails and minimal visitor facilities.

Category 2 Development: e.g. low-key recreation/resort/residential type development, small-scale agriculture/nurseries/narrow roads and small-scale infrastructure.

Category 3 Development: e.g. low density residential/resort type development, golf or polo estates, low to medium-scale infrastructure.

Category 4 Development: e.g. medium density residential development, sport facilities, small-scale commercial faculties/office parks, one-stop petrol stations, light industry, medium-scale infrastructure.

Category 5 Development: e.g. high density township/residential development, retail and office complexes, industrial facilities, refineries, treatment plants, power stations, wind energy farms, power lines, freeways, toll roads, large-scale infrastructure generally. Large-scale development of agriculture land and commercial tree plantations. Quarrying and mining activities with related processing plants.

Based upon the above categorization and the assessment criteria provided in the *Guidelines for Involving Visual and Aesthetic Specialists in EIA Processes* it is expected that the visual impact of the proposed activity would be classified as **'moderate'** (refer to the table below).

The objectives of the VIA described in this report is to:

a) determine whether such broad impact categorisation is appropriate and if not, to determine an appropriate category of impact;
b) formulate and implement measures or interventions that would mitigate any detrimental impacts to the extent that the activity will be acceptable.

Table 3: Categorization of expected visual impact (DEA&DP, 2005).

Type of environment	Type of development				
	Category 1	Category 2	Category 3	Category 4	Category 5
Protected/wild areas of international or regional significance	Moderate visual impact expected	High visual impact expected	High visual impact expected	Very high visual impact expected	Very high visual impact expected
Areas or routes of high	Minimal	Moderate	High visual	High visual	Very high

scenic, cultural, historical significance	visual impact expected	visual impact expected	impact expected	impact expected	visual impact expected
Areas or routes of medium scenic, cultural or historical significance	Little or no visual impact expected	Minimal visual impact expected	Moderate visual impact expected	High visual impact expected	High visual impact expected
Areas or routes of low scenic, cultural or historical significance/disturbed	Little or no visual impact expected. Possible benefits	Little or no visual impact expected	Minimal visual impact expected	**Moderate visual impact expected**	High visual impact expected
Disturbed or degraded sites / run-down urban areas / wasteland	Little or no visual impact expected. Possible benefits	Little or no visual impact expected. Possible benefits	Little or no visual impact expected	Minimal visual impact expected	Moderate visual impact expected

4 VIEWSHED ANALYSIS

4.1 Dominant View Corridors

As a first step of this VIA, a survey was undertaken to determine the existence of significant view corridors associated with the project site. A view corridor is defined as *'a linear geographic area, usually along movement routes, that is visible to users of the route'* (DEA&DP, 2005). Accordingly, two dominant *view corridors* were identified in the region, namely:

a) **N14-** The main movement corridor across the spine of the country between Springbok in the west and Pretoria in the east via Upington and Johannesburg.

b) **Carolusberg access road-** The primary access road to Carolusberg off the N14. This road also provides access to the Carolusberg Copper Mine.

When determining dominant view corridors, one has to take into consideration the class of the road and dominance and nature of the town/settlement in which direction it travels. In this regard, Carolusberg, as the nearest settlement to the project site, is regarded as a rural mining settlement within the municipality.

Such rural settlements are often not well positioned in terms of transportation routes or infrastructural developments. There is also often a lack of public/private investment in these areas.

4.2 Relevant Topographic and Physical Characteristics

A further key aspect affecting the potential visual impact of any proposed activity is the topography of the project site and the surrounding environment and the existence of prominent biophysical features from where the project site is visible. The topography and the major ridgelines of the area were subsequently determined and mapped by using a *Digital Elevation Model*[2].

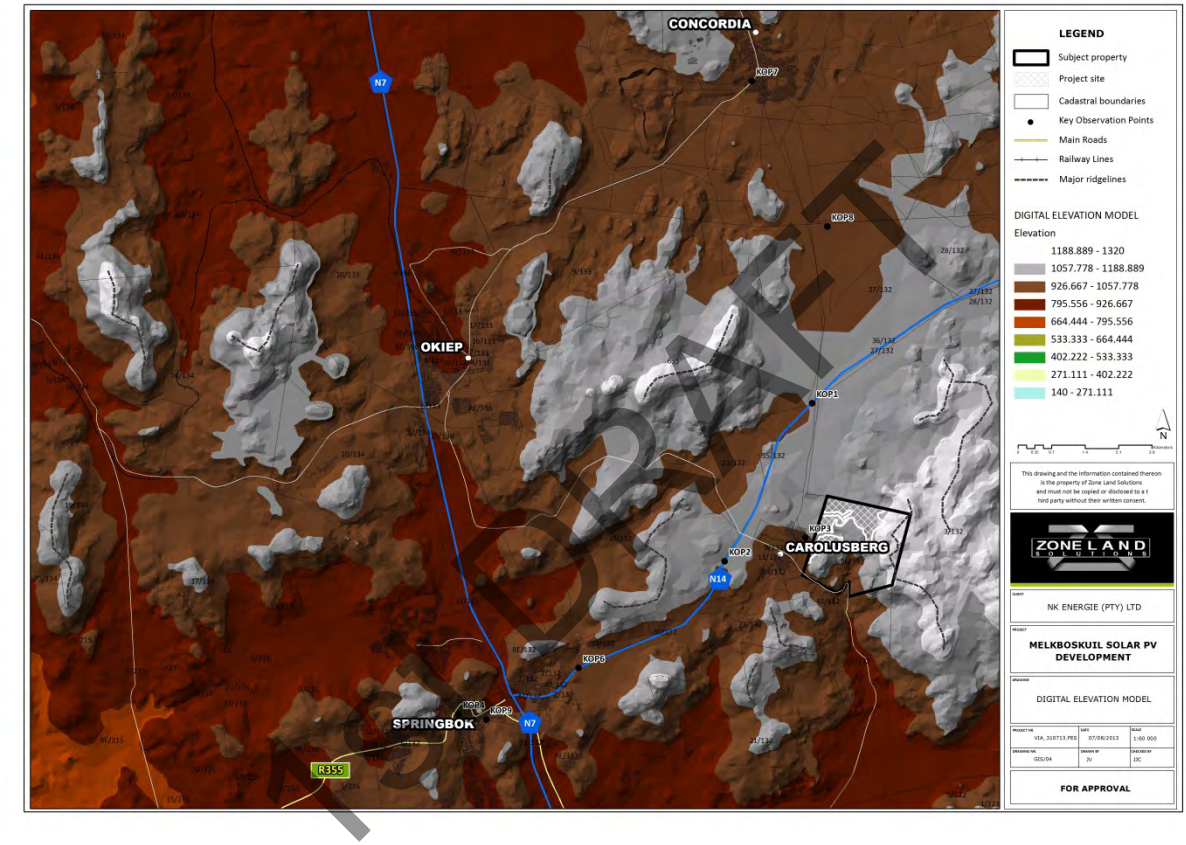

Figure 7: Digital Elevation Model illustrating major ridgelines and dominant view corridors in the sub-region.

As illustrated by the DEM, the project site is located at a mean elevation of approximately 1060m above sea level. It should however be noted that development site A will be located at 1210m above sea level, at its highest point. Development sites B-D will be located between 1060 and 1097m above sea level.

The DEM shows that the project site is located on the edge of the mountainous eastern parts of the Springbok region. Also evident from the DEM is that the proposed development sites are all located at a higher altitude than the settlement of Carolusberg

[2] A Digital Elevation Model (DEM) is a geographic information system-based outcome generated from contours for a specific area. In this instance, 20m contour intervals for reference sheet nos. 2917da and 2917db were used to calculate the DEM for the region.