

Wetland

Consulting Services (Pty.) Ltd.

Specialist wetland and riparian consultants

Wetland Consulting Services (Pty.) Ltd. 98/17216/07
P.O. Box 72295
Lynnwood Ridge
Pretoria
0040

Room S 157
Building 33
CSIR
Meiring Naude Road
Brummeria
Pretoria

Tel: 27 12 349 2699
Fax: 27 12 349 2993
E-mail: info@wetcs.co.za
Website: www.wetcs.co.za

TECHNICAL MEMORANDUM:

Wetland Impact Assessment Report Augmenting the Original Humansrus CSP Wetland Impact Assessment Report, with Inclusion of the Redstone Photovoltaic Power Project with an installed capacity of up to 20MW on the Remaining Extent of Farm No. 469, Hay District, Northern Cape Province

Date: 26 April 2018

Project No: 1312-2018

To: Leanna Janse van Rensburg

Company: ACWA Power SolarReserve Redstone Solar Thermal Power Plant RF (Pty) Ltd

From: Dieter Kassier

E-mail: dieterk@wetcs.co.za

1 BACKGROUND

Wetland Consulting Services (Pty) Ltd. (WCS) was appointed by ACWA Power SolarReserve Redstone Solar Thermal Power Plant RF (Pty) Ltd to compile an addendum to the original specialist wetland assessment report compiled for the Humansrus CSP Project (now known as the ACWA Power SolarReserve Redstone Solar Thermal Power Plant RF (Pty) Ltd (the Redstone CSP Project)). The purpose of this addendum is to identify and assess likely impacts to wetlands and riparian areas arising from the proposed inclusion of a Photovoltaic Power Plant with a generation capacity of up to 20MW with 30MWh storage (the PF Power Project) on the Remaining Extent of Farm 469, Hay District, Northern Cape Province (the "Project Site").

WCS undertook a field assessment of wetlands and riparian areas located within the Farm No. 469 during July 2011, the findings of which were detailed in the following reports:

WCS. 2011. *Wetland Delineation and Assessment for the Proposed Humansrus Solar Thermal Energy Plant near Postmasburg, Northern Cape*. Report reference: 734/2011.

WCS. 2015. *TECHNICAL MEMORANDUM: ACWA Power SolarReserve Redstone Solar Thermal Power Project – Response to Queries from the DWS*. Dated 3 November 2015.

The development, currently known as the Redstone CSP Project, was previously referred to as the Humansrus CSP Project.

2 PROJECT DESCRIPTION

For a full project description of the Redstone CSP Project, refer to the full EIA documentation. This project description deals solely with the proposed PV Power Project. The project description was provided by ACWA Power SolarReserve Redstone Solar Thermal Power Plant RF (Pty) Ltd.

The Redstone CSP Project proposes the development, construction and operation of a Photovoltaic (PV) Power Plant with the generation capacity of up to 20 MW, with up to 30MWhour storage, for the auxiliary load requirements, on the Remaining Extent of the Farm No. 469, Hay District. The planned PV Power Plant will be located approximately 30 km east of the town Postmasburg in the Northern Cape Province, adjacent to the Redstone CSP Project.

The proposed Project Site is located within the governing boundaries of the Tsantsabane Local Municipality and the ZF Mgcawu District Municipality. The Project is designed to allow the Redstone CSP Project to generate renewable green energy for self-consumption in order to operate and run the Redstone CSP Projects auxiliary load requirements. The Redstone CSP Project was authorised under the National Environmental Management Act 107 of 1998 (NEMA) by the Department of Environmental Affairs (DEA) Ref. Nr 12/12/20/2316 (AM7).

Option A: The PV Power Plant is proposed on the western boundary of the Project Site, adjacent to the Redstone CSP Project for ease of access to the power block/substation.

Option B: The PV Power Plant is proposed within the heliostat field of the Redstone CSP Project, for ease of access to the power block/substation.

The proposed PV Power Plant will extensively share infrastructure with the Redstone CSP Project. The following activities will however be required in addition to activities associated with the already authorised Redstone CSP Project. **Only additional activities are listed:**

Construction Phase

The construction phase will involve the construction and assembly of the PV panels, electrical systems, battery storage facility, and other infrastructure required for the operation of the plant. The construction phase will take approximately 2 – 6 months. Proposed additional activities include the following:

- Site establishment and the construction of access roads and services
- Site clearing and earthworks

Operational Phase

The operational phase will involve the generation of power using the PV technology and electrical systems well as the day-to-day management and maintenance of associated support services and infrastructure. The operational period for the PV Power Plant is linked with that of the Redstone

CSP Project Power Purchase Agreement of 25 years. Proposed additional activities include the following:

- Generation of electricity using PV technology
- Operational power supply and use

Decommissioning Phase

Depending on refitting and maintenance of the plant as well as national energy market conditions, the PV Project could continue to operate – however long it is required to. However, should plant operations be ceased for whatever reason, decommissioning and closure of the PV Project will be undertaken in accordance with the applicable EIA regulations. Similar to construction, the removal of the infrastructure associated with the project may involve the preparation of the area, given the amount of machinery and workers that will remain and work on the decommissioning. The following decommissioning activities are relevant:

- Establishment of small, temporary decommissioning camp and associated staff facilities
- Establishment of temporary laydown areas
- Removal of all waste by authorised waste management service providers
- Dismantling and removal of infrastructure, including PV panels
- Demolishing and rubble disposal of all concrete structures
- Rehabilitation of the disturbed footprints

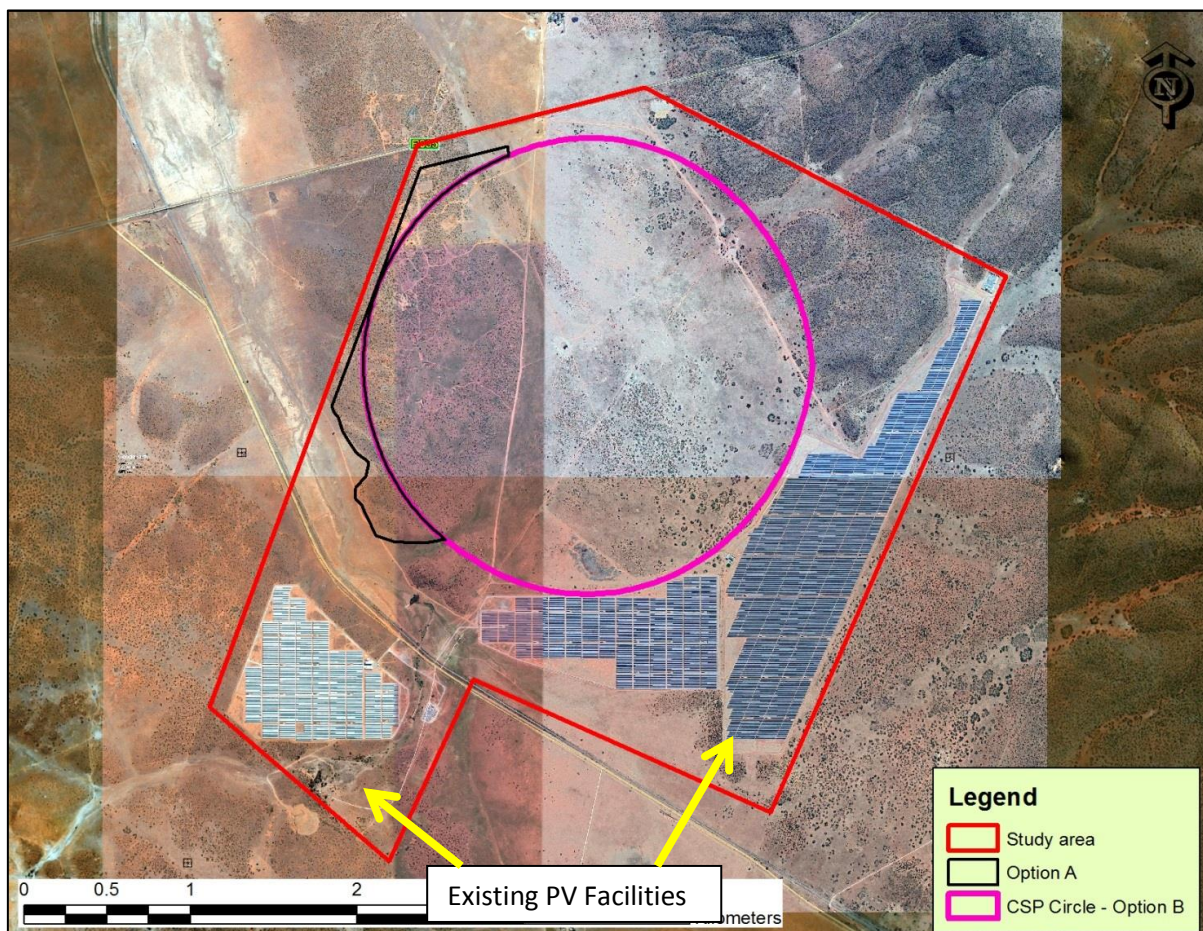


Figure 1. Map showing the Farm Humansrus together with already constructed infrastructure, the approved CSP circle footprint, as well as highlighting the proposed Option A and Option B locations for the proposed PV Power Plant.

3 BASELINE DESCRIPTION

The full baseline description is provided in the WCS (2011) report. This document provides a brief summary of the baseline conditions at the time of the field survey in 2011, as well as some indication of changes that have occurred on site since then. It was unfortunately not possible to undertake a follow up field survey to update baseline findings to reflect current conditions. However, in terms of extent and presence of wetlands and riparian zones, baseline findings are unlikely to have changed.

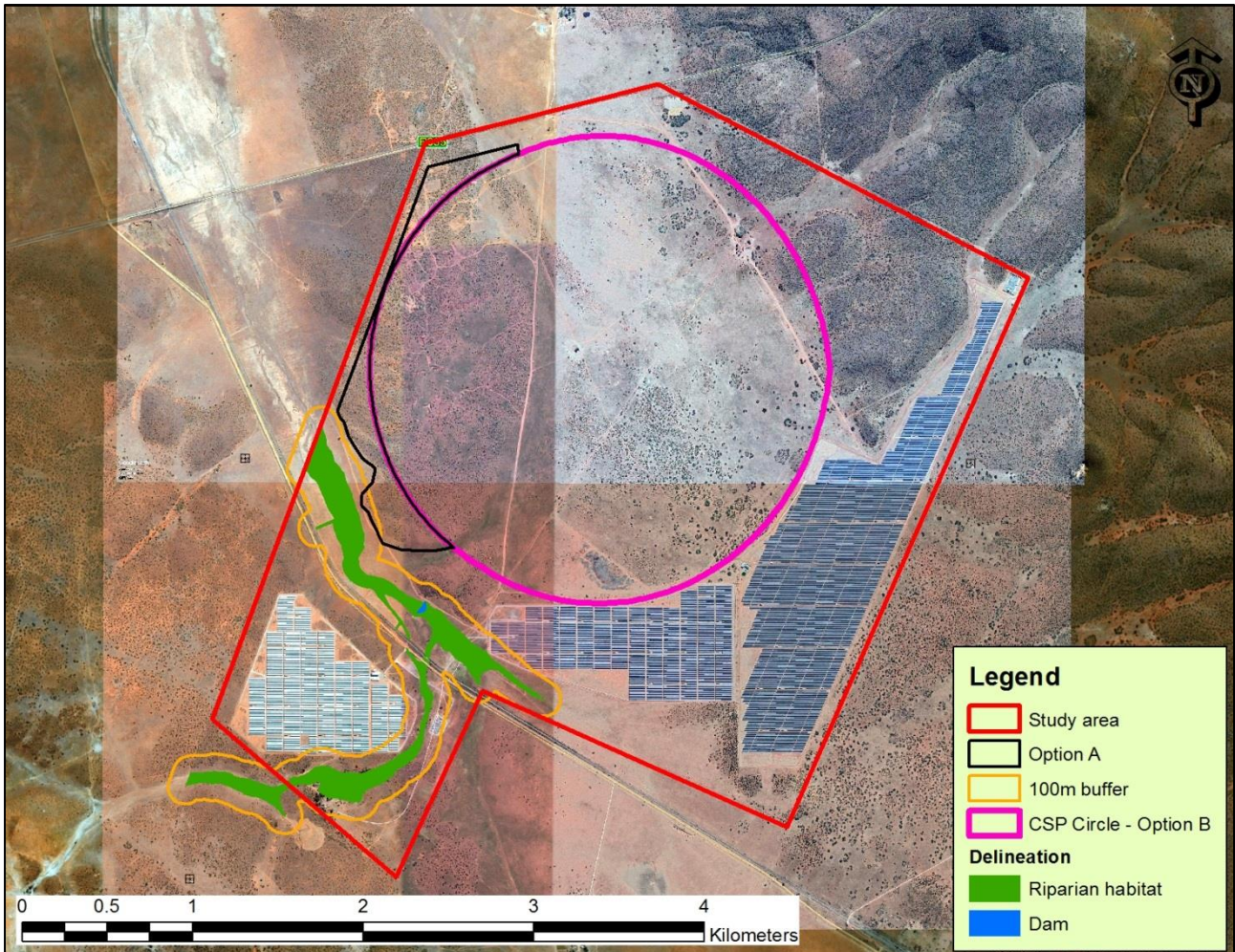


Figure 2: Map showing the delineated riparian areas within the Farm Humansrus, as well as the proposed Option A and Option B locations for the proposed PV Power Plant.

No wetlands were found to occur within the study area. The only riparian habitat identified is associated with the Groenwater Spruit, which traverses the south western portions of the study area. Figure 2 shows the identified and delineated wetlands and riparian habitats on site. The delineated riparian habitat covers approximately 31.7ha, which makes up only 2.5 % of the study site by area. In addition to the riparian habitat, a small farm dam constructed along the Groenwater Spruit was also identified.

In terms of existing and already authorised activities, none of these extend into the delineated riparian habitat. The existing PV facilities on site extend to within several meters of the delineated

riparian habitat, while the proposed CSP circle footprint remains more than 200m away from the delineated riparian habitat.

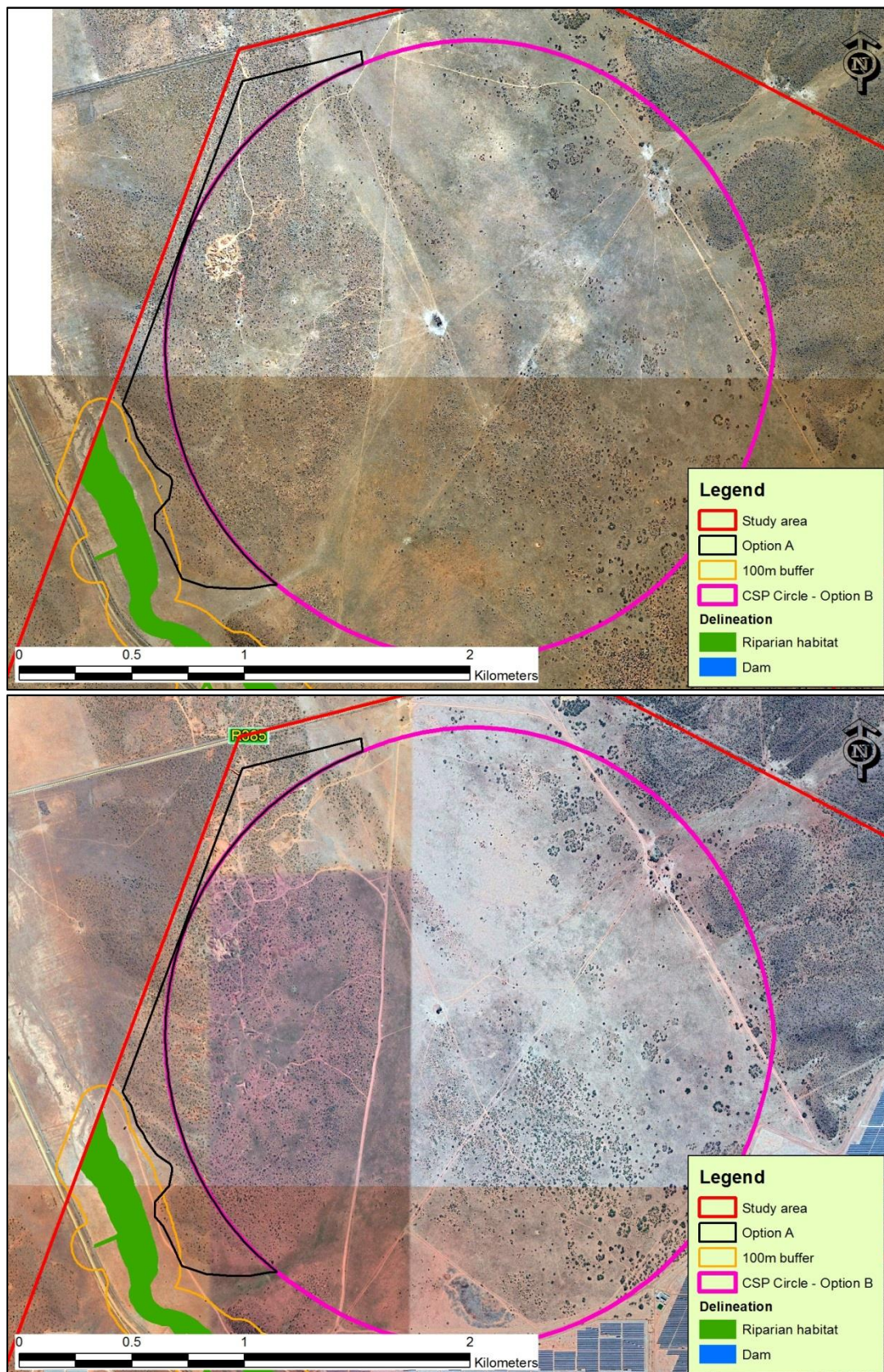


Figure 3. Comparison between aerial imagery sourced from Google Earth in 2011 (top) and 2018 (bottom) showing little change within the study area.

Figure 3 above shows aerial imagery sourced from Google Earth in 2011 (top image) compared to Google Earth imagery from 2018 (bottom image – access 26 April 2018). With respect to the greater study area, the most obvious change is the installation of the large PV facilities in the south and south east of the farm, as well as some disturbances around the perimeter of these facilities. For the proposed Options A and B however, the landuse between the two images is mostly the same, though there appears to have been an increase in disturbances related to quarrying in the north of the Option A area. No change could be discerned from the aerial imagery in relation to the Groenwater Spruit.

A report compiled by Knight Piesold (December, 2016) entitled “ACWA POWER SOLARRESERVE REDSTONE SOLAR THERMAL POWER PLANT PROJECT Water Use Licence Management Monitoring Requirements” was reviewed to determine if any changes to the water resources of the area had occurred since the 2011 survey, but this proved to be of limited use.

4 IMPACT ASSESSMENT

4.1 Comparison of Alternatives

Two alternatives have been proposed for the 20MW PV Power Plant:

Option A: The PV Power Plant is proposed on the western boundary of the Project Site, adjacent to the Redstone CSP Project for ease of access to the power block/substation.

Option B: The PV Power Plant is proposed within the heliostat field of the Redstone CSP Project, for ease of access to the power block/substation.

From a wetland and riparian perspective Option B is preferred for the following reasons:

- The proposed PV Power Plant will be located within the CSP circle, which is an area that will already be disturbed and transformed during construction of the heliostat field. Locating the proposed PV Power Plant in this area will therefore not increase the overall disturbance footprint.
- The CSP circle is located further away from the delineated Groenwater Spruit, being located more than 200m from the delineated edge.
- Stormwater generated by the proposed PV Power Plant will enter the stormwater system of the heliostat field, foregoing the need for further stormwater management infrastructure.

It is therefore recommended that, if technically possible, the proposed PV Power Plant be located within the CSP circle. However, should this not be possible, location of the PV Power Plant within the Option A area is also considered feasible, but subject to the recommendations of the impact assessment and mitigation measures detailed below.

4.2 Impact Identification

As is clear from Figure 2 above, both Option A and Option B are located outside the delineated riparian habitat. No direct loss of riparian habitat will therefore occur as a result of the proposed development. Indirect impacts to the riparian habitat could however result, predominantly as a result of changes to the quantity and quality of run-off from the catchment. The upper reaches of the Groenwater Spruit, as well as most of the small watercourses of the general area, are expected to be maintained predominantly by surface runoff generated after significant rainfall events. The watercourses are expected to flow for short periods, followed by extended dry periods. The proposed development, which will increase impervious surfaces within the study area, will result in increased surface runoff being generated and entering the Groenwater Spruit. Such an increase in flow could potentially lead to increased risk of erosion, specifically if such flow enters the Groenwater Spruit as a point source.

In the case of Option B, the Redstone CSP Project heliostat field, such impacts will take place within an area already subject to these same impacts (the heliostat field), which have been addressed as part of the EIA and mitigation measures recommended during the EIA process. Should the development proceed in the Option A area, likely impacts include:

- An increase in impervious surfaces on site could result in increased volumes and velocities of run-off entering the water courses, resulting in increased erosion and channel incision.
- Water quality deterioration could result as a consequence of spillages or disposal of waste, as well as from the release of contaminated water or treated effluent

Phase:	Construction				
Aspect:	Wetlands & Riparian Areas				
Activity:	1. Site establishment, clearing and earthworks				
Impact:	<p>Direct Impact: None</p> <p>Indirect: Increased surface runoff from bare soil areas leading to increased sediment transport into adjacent watercourses and increased risk of erosion. Water quality likely to be impacted by increased turbidity and suspended solids.</p> <p>Cumulative Impacts: A further increase in impervious surfaces on site will result in increased runoff.</p> <p>Residual Impacts: Erosion will result in a loss of soil from the receiving water resources and changes in geomorphology.</p>				
Significance rating:	Duration	Extent	Magnitude	Probability	Significance
Pre-Mitigation	2	2	6	4	40
Post-Mitigation	2	1	4	3	21
Mitigation Measures:	A minimum buffer area of 32m should be maintained between the proposed PV Power Plant development area and the Groenwater Spruit riparian zone. If possible, this buffer zone should be increased further. The buffer zone must be maintained as a fully vegetated buffer strip between the				

	<p>development and the riparian habitat. No intrusion into the buffer should be allowed.</p> <p>A construction stormwater management plan must be developed and implemented prior to the commencement of large scale vegetation clearing activities or construction activities and be maintained until the end of the construction phase. Such a plan should aim to minimise the transport of sediment off site as well as prevent the discharge of high velocity flows into downslope wetlands. Sediment traps and sediment barriers should be installed where necessary, and discharge points should be protected against erosion and incorporate energy dissipaters.</p> <p>To minimise the impact of increased runoff and sediment transport into adjacent watercourses, vegetation clearing and soil stripping should be concentrated in the dry season.</p> <p>Erosion within the construction site must be minimised through the following:</p> <ul style="list-style-type: none"> ○ Limiting the area of disturbance and vegetation clearing to as small an area as possible; ○ Where possible, undertaking construction during the dry season; ○ Phasing vegetation clearing activities and limiting the time that any one area of bare soil is exposed to erosion; ○ Control of stormwater flowing onto and through the site. Where required, stormwater from upslope should be diverted around the construction site; ○ Prompt stabilisation and re-vegetation of soils after disturbance and construction activities in an area are complete; and ○ Protection of slopes. Where steeper slopes occur, these should be stabilised using geotextiles or any other suitable product designed for the purpose. <p>Sediment transport off the site must be minimised through the following:</p> <ul style="list-style-type: none"> ○ Establishing perimeter sediment controls. This can be achieved through the installation of sediment fences along downslope verges of the construction site. Where channelled or concentrated flow occurs, reinforced sediment fences or other sediment barriers such as sediment basins should be used (refer to US EPA guidelines on Stormwater Pollution Prevention); ○ Discharge of stormwater from the construction site into adjacent grassland rather than directly into wetland habitat. Discharged flows must be slow and diffuse; and ○ Regular inspection and maintenance of sediment controls
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Phase:	Operation				
Aspect:	Wetlands & Riparian Areas				
Activity:	1. Operation of the PV Power Plant and day to day maintenance activities				
Impact:	<p>Direct Impact: None</p> <p>Indirect: Discharge of stormwater generated on site.</p> <p>Cumulative Impacts: A further increase in impervious surfaces on site will result in increased runoff. Stormwater discharges could impact on water quality within receiving watercourses.</p> <p>Residual Impacts: Erosion will result in a loss of soil from the receiving water resources and changes in geomorphology.</p>				
Significance rating:	Duration	Extent	Magnitude	Probability	Significance

Pre-Mitigation	4	2	4	4	40
Post-Mitigation	4	1	2	2	14
Mitigation Measures:	<p>A minimum buffer area of 32m should be maintained between the proposed PV Power Plant development area and the Groenwater Spruit riparian zone. If possible, this buffer zone should be increased further. The buffer zone must be maintained as a fully vegetated buffer strip between the development and the riparian habitat. No intrusion into the buffer should be allowed.</p> <p>A stormwater management plan must be developed and implemented for the proposed PV Power Plant. Stormwater discharge points must be protected against erosion. No stormwater discharges directly into the Groenwater Spruit, but rather into vegetated terrestrial areas adjacent to the riparian habitat.</p> <p>Strict controls must be placed on the use of potential contaminants on site, e.g. hydrocarbons, cleaning materials etc. Potential contaminants must be stored in suitable bunded areas and handled according to environmental best practice guidelines as per the DWS Integrated Environmental Management Series.</p>				

5 RECOMMENDATIONS

The proposed PV Power Project will be located outside the delineated riparian habitat on site and will not result in any direct impact to riparian areas or associated watercourses. Indirect impacts to watercourses could result as a consequence of changes in runoff volume, velocity and quality from the development footprint. Mitigation measures have been proposed to address these.

It is our opinion that the proposed PV Power Project, which will have a footprint of just less than 20ha, will add to the impact of the overall Redstone CSP Project by increasing the overall disturbance footprint. However, in the context of the approximate 570 ha Redstone CSP Project heliostat field and the almost 300 ha existing PV facilities, the proposed PV Power Plant represents an increase of only 2.3 % to the overall disturbance area.

If the proposed mitigation measures, which aim to address the potential changes in runoff characteristics of the landscape, are fully implemented, it is our opinion that the development could be authorised. If technically feasible, the selection of Option B, i.e. the installation of the PV Power Project within the Redstone CSP Project heliostat field, is preferred. Should Option A proceed, it is recommended that a minimum 32m buffer zone of natural vegetation be maintained between the PV Power Project footprint and the Groenwater Spruit riparian habitat.