Proposed Tutuka solar photovoltaic facility, Mpumalanga

DWS (2014) risk assessment

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Declaration of Independence

I, **Antoinette Bootsma**, in my capacity as a specialist consultant, hereby declare that I -

- Act as an independent consultant;
- Do not have any financial interest in the undertaking of the activity, other than remuneration for the work performed in terms of the National Environmental Management Act, 1998 (Act 107 of 1998);
- Undertake to disclose, to the competent authority, any material information that has or may have the potential to influence the decision of the competent authority or the objectivity of any report, plan or document required in terms of the National Environmental Management Act, 1998 (Act 107 of 1998);
- As a registered member of the South African Council for Natural Scientific Professions, will undertake my profession in accordance with the Code of Conduct of the Council, as well as any other societies to which I am a member; and
- Based on information provided to me by the project proponent, and in addition to information obtained during the course of this study, have presented the results and conclusion within the associated document to the best of my professional judgement.

2016.11.24

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Date

Ecologist/Botanist

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Indemnity

This report is based on survey and assessment techniques which are limited by time and budgetary constraints relevant to the type and level of investigation undertaken. The findings, results, observations, conclusions and recommendations given in this report are based on the author's best scientific and professional knowledge as well as available information at the time of study. Therefore, the author reserves the right to modify aspects of the report including the recommendations if and when new information may become available from ongoing research or further work in this field, or pertaining to this investigation.

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1 INTRODUCTION

Limosella Consulting (Pty) Ltd was appointed by Savannah Environmental (Pty) Ltd to conduct wetland and riparian delineations and functional assessments to inform the Environmental Authorization process for the development of the Tutuka solar photovoltaic (PV) facility in Mpumalanga (Figures 1 and 2). This facility is part of a series of proposed projects to harvest renewable energy to supplement the national power grid.

The current document discusses the Department of Water and Sanitation risk assessment for this proposed PV facility as stipulated in the August 2016 General Authorisation in terms of Section 39 of the National Water Act, 1998 (Act no. 36 of 1998) for water uses as defined in Section 21(c) or section 21(i). Values presented for the risk categories are calculated for the proposed activities and assumes that effective mitigation has been applied during each phase of the development, as discussed in the impact tables below, particularly Table 6. The value of impacts before mitigation are not discussed in detail.

The followings section is taken verbatim from the Section 21(c) and (i) Risk-based Assessment and Authorisation document, dated October 2014 (hereafter referred to as DWS, 2014):

In terms of section 22 of the National Water Act (36 of 1998)(NWA) a person may only use water if it is permissible under Schedule 1, a continuation of an ELU, a GA, a licence or the requirement for a licence has been dispensed with under section 22(3). There are 11 different types of water uses contemplated in section 21, but the purpose of this Risk- Based Water Use Authorisation Guideline is to deal with section 21(c) and (i) water uses only.

Water use in terms of section 21(c) and (i) of the NWA is:

- *(c) impeding or diverting the flow of water in a watercourse; and*
- *(i) altering the bed, banks, course or characteristics of a watercourse.*

However, unlike some water uses referred to in section 21, e.g. (a) and (b) which are consumptive and whose impacts are usually clearly evident, easier to manage and quantifiable, section 21(c) and (i) water uses are non-consumptive and their impacts more difficult to detect and manage. They are also generally difficult to clearly quantify. However, if left undetected these impacts can significantly change various attributes and characteristics of a watercourse, and water resources, especially if left unmanaged and uncontrolled. Thus, the risks posed by section 21(c) and (i) water uses on watercourses and water resources are an important consideration during the authorisation of these water uses.

The assessment presented in this document is based on the Risk Assessment Toolkit discussed in DWS (2014).

1.1 Assumptions and limitations

This document is based on information as received by Envirolution Consulting and includes:

- Scientific Aquatic Services wetland assessment report (dated 2015);
- Eskom Tutuka Solar PV Concept Design Report - rev 01 (dated 2016);
- Eskom conceptual plant and substation layouts;
- An example of the stormwater management plan that will be applied to the Tutuka PV plant;
- Eskom Water Management Policy (dated 2016); and

- Eskom Water Strategy Policy (dated 2015).

The document takes into account likely impacts to wetlands and watercourses that can arise during the construction and operation of the new PV facility including:

- Erecting and operating the Solar PV panels and associated stormwater networks within the 500 m radius of wetlands;
- Construction of transmission lines, substations and inverters;
- Temporary establishment of contactors yard and laydown area; and
- Construction of 6 m wide temporary access roads.

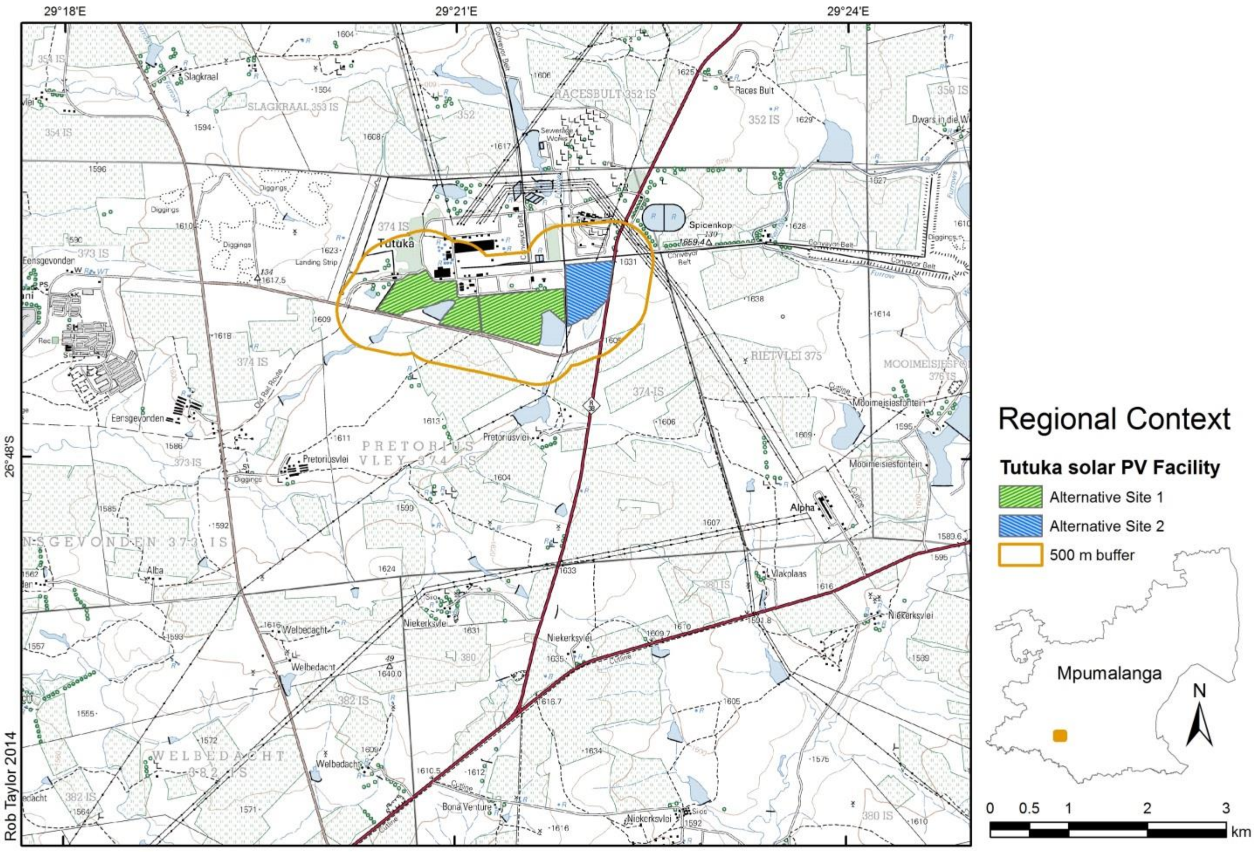

Figure 1: Locality Map

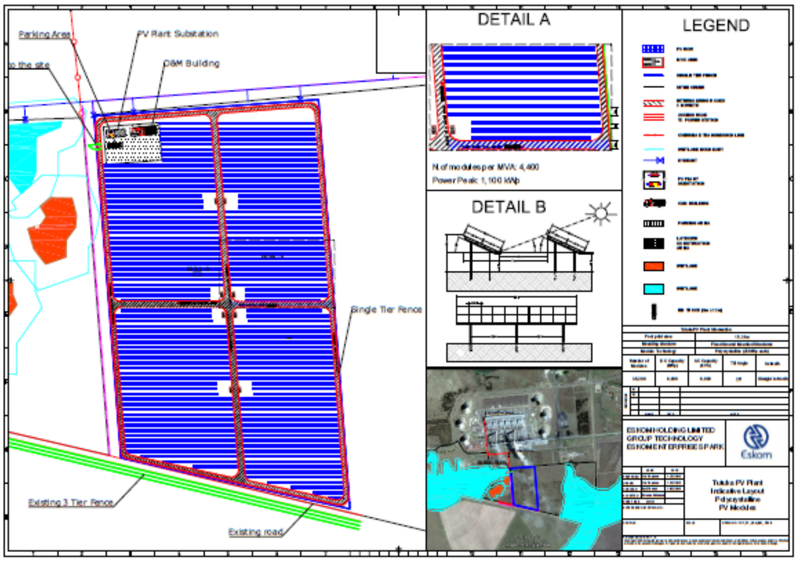

Figure 2: Conceptual design of the Tutuka PV Plant (Eskom, 2016)

2 METHODOLOGY

Risk-based management has value in providing an indication of the potential for delegating certain categories of water use "risks" to DWS regional offices (RO) or Catchment Management Agencies (CMA). Risk categories obtained through this assessment serve as a guideline to establish the appropriate channel of authorisation of these water uses.

The DWS has therefore developed a risk assessment matrix to assist in quantifying expected impacts. The scores obtained in this assessment are useful in evaluating how the proposed activities should be authorised.

The formula used to derive a risk score is as follows:

RISK = CONSEQUENCE x LIKELIHOOD

CONSEQUENCE = SEVERITY + SPATIAL SCALE + DURATION

LIKELIHOOD = FREQUENCY OF THE ACTIVITY + FREQUENCY OF THE IMPACT +LEGAL ISSUES + DETECTION

Table 1 below provides a description of the classes into which scores are sorted, and their implication for authorisation.

Table 1: An extract from DWS (2014) indicating the risk scores and classes as well as the implication for the appropriate authorization process

RATING	CLASS	MANAGEMENT DESCRIPTION	AUTHORISATION	DELEGATION
1 – 55	(L) Low Risk	Acceptable as is or consider requirement for mitigation. Impact to watercourses and resource quality small and easily mitigated. Wetlands are excluded.	GA	Regional Head
56 – 169	(M) Moderate Risk	Risk and impact on watercourses are notably and require mitigation measures on a higher level, which costs more and require specialist input. Wetlands are excluded.	WUL	Regional Head
170 – 300	(H) High Risk	Always involves wetlands. Watercourse(s) impacts by the activity are such that they impose a long-term threat on a large scale and lowering of the Reserve.	WUL	Director General

3 DESCRIPTION OF ENVIRONMENT AND WATERCOURSES AFFECTED

3.1 Delineated Water Courses

During this assessment, two unchannelled valley-bottom wetlands, were recorded within the study area (Figure 2). The PES scores for the wetlands is a D (→) (largely modified) - A large change in ecosystem processes and loss of natural habitat and biota has occurred. The wetlands have been modified by several dams, roads and invasion of alien plants. The EIS score of 1.6 falls into a category characterised by moderate ecological importance and sensitivity. Wetlands in this category are considered to be ecologically important and sensitive on a provincial or local scale. According to the generic description of this class the biodiversity of these wetlands are not usually sensitive to flow and habitat modifications. The study site falls within the quaternary catchment C11K.

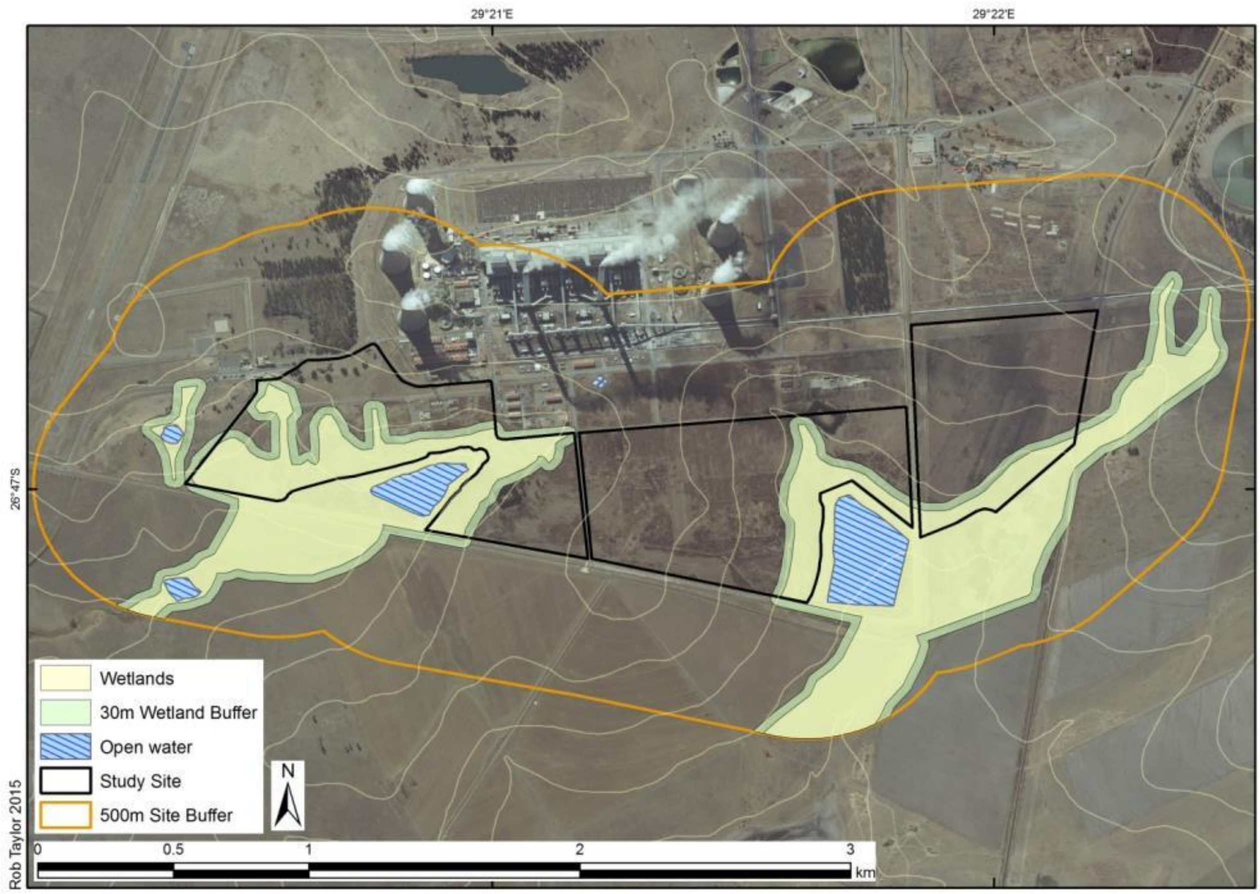

Figure 3: Wetland areas and buffer zones associated with the proposed PV plant (Limosella, 2015).

3.2 Wetland Integrity and Function

The PES and EIS scores were calculated for all of the wetlands likely to be impacted by the proposed project. Important features are summarized in Tables 2 and 3 below:

Table 2: Important features relevant to the wetlands assessed

Wetland Unit		Hydrology		Geomorphology		Vegetation	
		Impact Score	Change Score	Impact Score	Change Score	Impact Score	Change Score
Unchannelled valley-bottom		6.5	0	2	0	3.66	-1
PES Category and Projected Trajectory		**E**	→	**C**	→	**C**	↓

Table 3: The PES and EIS scores of wetlands assessed

	Impact Score	Category	Change score	Change Symbol	Health class
Overall Health Score for the Entire Wetland	**4.4**	**D**	**-0.33**	**→**	**D (→)**

4 EXPECTED IMPACTS

Eskom is committed to low impact activities as specified in the Eskom Water Management Policy and the Eskom Water Strategy Policy. Therefore, unless soil conditions or other engineering specifications determine it to be necessary, the risk assessment below assumes:

- PV panels will be supported by foundations of screwed or rammed piles, or pre-drilled holes with backfilling or concrete;
- Best practice stormwater management will be implemented following the example of the Grootvlei stormwater management plan; and
- Vegetation will be maintained between the PV panels.

An extract from the Risk Matrix spreadsheet presented in Tables 2 – 4 below show that the expected risk score of operation of the PV plant falls within the Medium risk category which refers to risk and impact on watercourses that are notable and require mitigation measures on a higher level, which costs more and require specialist input. Activities which fall within this category should be authorised through a Water Use Licenc

Table 4: The severity score derived from the DWS (2014) risk assessment matrix for the proposed PV plant construction and operation

Activity	Aspect	Phase	Impact	Flow Regime	Physico & Chemical (Water Quality)	Habitat (Geomorph+ Vegetation)	Biota	Severity
Erecting the Solar PV panels	Temporary 6m wide access roads to be rehabilitated after construction	Construction	Loss of vegetation cover, compaction of soils, sedimentation, pollution and alien invasive plant establishment	1	1	1	1	**1**
	Installation of foundation for the PV panels, piles or screws			1	2	1	1	**1.25**
	Construction of the transmission line, inverters, substation, and stormwater infrastructure			1	1	1	1	**1**
	Temporary establishment of contactors yard and laydown area			1	1	1	1	**1**
Operation of the PV facility	Long term presence of PV structures and stormwater infrastructure adjacent to wetlands	Operation	Increased surface warming, decreased water infiltration into the soil, permanent changes to runoff characteristics in the wetland catchments including the cumulative impact to downstream watercourses	2	2	1	1	**2**

	Ad hoc repair and maintenance to structures, including washing of panels			1	1	1	1	**1**

Table 5: The significance score derived from the DWS (2014) risk assessment matrix for the proposed activities

Activity	Aspect	Spatial scale	Duration	Consequence	Frequency of activity	Frequency of impact	Legal Issues	Detection	Significance	Risk Rating
Erecting the Solar PV panels	Temporary 6m wide access roads to be rehabilitated after construction	2	2	5	1	2	5	2	50	**L**
	Installation of foundation for the PV panels, piles or screws	2	2	5.25	1	2	5	2	52.5	**L**
	Construction of the transmission line, inverters, substation, and stormwater infrastructure	1	1	3	1	3	5	2	33	**L**
	Temporary establishment of contactors yard and laydown area	1	1	3	1	3	5	2	33	**L**
Operation of the PV facility	Long term presence of PV structures and stormwater infrastructure adjacent to wetlands	2	4	7	4	1	5	2	78	**M/L**
	Ad hoc repair and maintenance to structures, including washing of panels	1	1	3	3	3	5	2	39	**L**

Table 6: Severity scores with mitigation measures

Activity	Aspect	Risk Score	Control Measure	Type of Watercourse
	Installation of foundation for the PV panels, piles or screws	L	• **During the detailed design phase, the footprint and design of structures, particularly stormwater infrastructure, should aim to have the least impact on habitat quality and hydrology of the river. Designs should take into account soil properties, slopes and runoff energy. In Granitic or sandy soils, stormwater should be allowed to infiltrate into the soil profile to follow natural subsurface flowpaths to sustain wetlands lower in the landscape.** • Apply a 50m buffer zone to the edge of the wetland. The development footprint should avoid this no-go area • The wetland on the development site must be left as a strict no-development zone, and must not be physically affected in any way. • A temporary fence or demarcation must be erected around the works area to prevent water runoff and erosion of the disturbed or heaped soils into watercourse areas. • Retain vegetation and soil in position for as long as possible, removing it immediately ahead of construction / earthworks in that area (DWAF, 2005). • During the construction phase measures must be put in place to control the flow of excess water so that it does not impact on the surface vegetation. • Protect all areas susceptible to erosion and ensure that there is no undue soil erosion resultant from activities within and adjacent to the construction camp and work areas. • Implementation of best management practices • Project engineers should compile a method statement, outlining the construction and earthwork methodologies. The required mitigation measures to limit the impacts on the watercourse and associated buffers should be contained within the method statement. The method statement must be approved by the ECO and be available on site for reference purposes • All equipment should be parked overnight and/or fuelled at least 500 meters from a watercourse • Drip trays (minimum of 10cm deep) must be placed under all vehicles that stand for more than 24 hours. Vehicles suspected of leaking must not be left unattended, drip trays must be utilised. • Drip trays must be utilised during repairs and maintenance of all machinery. The depth of the	Wetland adjacent to the PV plant
	Construction of the transmission line, inverters, substation, and stormwater infrastructure	L		
	Temporary establishment of contactors yard and laydown area	L		

drip tray must be determined considering the total amount / volume of oil in the vehicle. The drip tray must be able to contain the volume of oil in the vehicle.

- Provision of adequate sanitation facilities located outside of the wetland/riparian area or its associated buffer zone
- Remove all construction equipment and material on completion of construction
- The contractor shall ensure that excessive quantities of sand, silt and silt-laden water do not enter watercourses. Appropriate measures, e.g. erection of silt traps, or drainage retention areas to prevent silt and sand entering drainage or watercourses must be taken
- Where wetlands are adjacent to the construction areas and these areas slopes toward the wetland, install sediment barriers along the edge of the construction areas as necessary to prevent sediment flow into the wetland.
- Sediment barriers must be properly maintained throughout construction and reinstalled as necessary until replaced by permanent erosion controls or restoration of adjacent upland areas is complete
- Construction equipment must be cleaned prior to site access. This will prevent alien invasive seed from other sites to spread into disturbed soils
- Cement should only be mixed within mixing trays. Washing and cleaning of equipment should also be done within a bermed area, in order to trap any cement or plaster and avoid excessive soil erosion. These sites must be rehabilitated prior to commencing the operational phase
- The mixing of concrete should only be done at specifically selected sites on mortar boards or similar structures to contain run-off into drainage lines, streams and natural vegetation
- Materials such as fuel, oil, paint, herbicide and insecticides must be sealed and stored in bermed areas or under lock and key, as appropriate, in well-ventilated areas
- These substances must be confined to specific and secured areas within the contractor’s camp, and in a way that does not pose a danger of pollution even during times of high rainfall
- Storage of materials as described above may not be within the 1:100 floodline, watercourses or associated buffer areas
- In the case of pollution of any surface or groundwater, the Regional Representative of the Department of Water and Sanitation (DWS) must be informed immediately and corrective action taken
- A vegetation rehabilitation plan should be implemented after decommissioning of the laydown area and access roads. Grassland can be removed as sods and stored within transformed

			vegetation. The sods must preferably be removed during the winter months and be replanted by latest springtime. The sods should not be stacked on top of each other or within sensitive environs. Once construction is completed, these sods should be used to rehabilitate the disturbed areas from where they have been removed. In the absence of timely rainfall, the sods should be watered well after planting and at least twice more over the next 2 weeks. • Rehabilitation plans must be submitted and approved for rehabilitation of damage during construction and that plan must be implemented immediately upon completion of construction. • Cordon off areas that are under rehabilitation as no-go areas using danger tape and steel droppers. If necessary, these areas should be fenced off to prevent vehicular or pedestrian access. • Monitoring should be done for at least three years after completion of the construction of the bridge to highlight any erosion or other negative changes to downstream hydrology. Should such negative impacts be observed, a rehabilitation plan should be implemented to correct this impact.	
	Long term presence of PV structures adjacent to wetlands	**M/L**	• **During the design phase, the footprint and design of structures should aim to have the least impact on habitat quality and hydrology of the river** • Stormwater should not be released into the wetland or its buffer zone • Control of alien invasive plants should form part of the maintenance plan for the PV plant • In the case of pollution of any surface or groundwater, the Regional Representative of the Department of Water and Sanitation (DWS) must be informed immediately and corrective action taken • Management of point discharges • Pollution control • Maintenance activities should follow best practice • Monitoring for downstream degradation	Catchment of wetlands and downstream watercourses
	Ad hoc repair and maintenance to structures, including washing of panels	**L**	• Apply best practice methods and the mitigation measures specified above for the construction phase	Wetland adjacent to the PV plant

5 CONCLUSION

The operation of the PV plant, including its associated stormwater management infrastructure obtains a score that falls in the **Medium** category. This is primarily due to the long term effect of potential impacts, such as altered surface water runoff and potential changes to water flowpaths that sustain the wetland. However, the risk assessment matrix allows for conditions where specific mitigation measures will ensure that the expected impact will be managed in order to have no nett effect on the watercourse. In such a case, the risk category may be lowered by a maximum of 25 points. Should the risk score then fall within a **Low** category, the activity may be authorised through a General Authorization. In the case of the risk scores for the proposed PV plant, the risk score of 78 for the long term changes to the catchment, lowered by 25 points, falls to 53 which does fall in the **Low** category.

The specific mitigation measures that must be in place in order for this condition to apply to the proposed PV plant are listed in red in the table above and include the following:

- Structures associated with the PV plant (including the stormwater system) should be designed to have no nett impact on habitat quality and hydrology of the river Designs should take into account soil properties, slopes and runoff energy and should be based on empirical data. Where necessary, additional attenuation and dissipation structures should be implemented.
- The principles of the SUDS (South African Guidelines for Sustainable Drainage Systems, Armitage et al, 2013) should be applied to the design. This includes using porous paving, grassed swales and slow release of stormwater into the soil profile.
- The release of stormwater should occur into vegetated attenuation structures located outside the 50m buffer zone of the delineated wetland
- Monitoring should be designed in such a way as to immediately detect pollution, erosion or sedimentation of the watercourse. A rehabilitation plan should be in place to address potential impacts in an effective manner.

The construction phase impacts should be mitigated by relatively standard measures associated with best practice methods, together with effective monitoring and rehabilitation where this becomes necessary.

The confidence level with which this assessment was done is Medium.

6 REFERENCES

Department of Water Affairs and Sanitation (2014) Risk-based Water Use Authorisation Approach and Delegation Protocol for Section 21(c) and (i), Edition 02

Limosella (2015): Proposed Tutuka solar photovoltaic facility, Mpumalanga: Wetland delineation and functional assessment. Submitted to Savannah Consulting

Eskom (2016). Tutuka Solar PV Concept Design Report. 360-TUT-AABBZ226-RP0000-7