



D9: Engineering Services Report including a Stormwater Management Plan

NEW 115MW SOLAR PLANT FACILITY (CARPE DIEM NORTH)

**PORTION 5 OF FARM VARKENSLAAGTE NO 119, CARLETONVILLE, WITHIN THE
MERA FONG CITY MUNICIPAL AREA, GAUTENG**

CIVIL ENGINEERING SERVICES REPORT

REVISION 00

MARCH 2024



Legacy Environmental Management Consulting

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ENGINEERING SERVICES REPORT FOR THE PROPOSED DEVELOPMENT OF A NEW 115MW SOLAR PLANT FACILITY (CARPE DIEM NORTH), PORTION 5 OF FARM VARKENSLAAGTE NO 119, CARLETONVILLE, WITHIN THE MERA FONG CITY MUNICIPAL AREA, GAUTENG

1. Background

UDS Africa was appointed by Legacy Environmental Management Consulting to compile a services report in support of the new Carpe Diem 115MW solar plant facility on portion 5 of Farm Varkenslaagte no 119, near the town of Carletonville. The site is split into a northern

The site covers an area of 275.06ha and is currently undeveloped. It is proposed that approximately 168 112 Solar Photovoltaic (PV) panels are installed on the subject property. Each of these panels have a height of 2m and a width of 1m, which is fixed to a mounting structure, grouped into a table with a maximum of 5m above the natural ground level.

Apart from the PV panels the following facilities will also be constructed on the site:

- Facility substation
- Office facilities (gatehouse security, warehouse, canteen, visitors centre, switch room, staff lockers and control centre)
- Access and internal roads
- Conservancy tanks
- Overhead Powerlines
- Perimeter fencing

At the time of this report, detailed site development plans were not yet available. Please refer to the approximate area schedule below derived from the available drawings at the time.

DESCRIPTION	AREA (m ²)
168 112 Solar Photovoltaic (PV) panels	1 572 444.60m ²
Buildings	10 000m ²
Substation	20 030m ²

WATER DEMAND						
DEVELOPMENT	Units	l/ unit/ day	l/ ha/ day	l/ 100m ²	TOTAL (l/d)	TOTAL (l/s)
Solar Facility Staff members	40	60			2 400	0.027
TOTAL					2 400	0.027
Annual Average Daily Demand (AADD)	2 400 l/d 0.027 l/s					

In addition to the domestic water demand, the PV panels will be washed a minimum of two times per year to a maximum of four times per year. The washing of a PV panel will use approximately 2 liters, thereby amounting to 336m³ per washing cycle, totaling 1 345m³ per annum.

This brings the total annual domestic water demand to 2 221m³, averaging a daily demand of 6 084.65 l/day.

It is anticipated that for construction purposes the daily water demand will be 40 000 l/day, for a period of 12 to 18 months.

4.2 Availability of water reticulation services

Currently the Merafong City Municipal Area is experiencing a number of issues on the existing water supply network. This is largely due to the formation of sink holes affecting water supply in the municipal area. At the time of this report the Merafong City Municipality indicated that only four out of eight reservoirs are currently operational in the Carletonville area.

It is proposed that groundwater is extracted by means of borehole to supply water for the construction as well as the operational phase of the solar facility. Taking into consideration a 24hr extraction period, the required yield would need to 0.463 l/s during the construction phase and 0.070 l/s during the operation phase of the facility.

The alternative would be to cart water to the PV facility from the closest municipal stand pipe or from local farms and to store it in Jo-Jo tanks for domestic use.

5. Sewerage

5.1 Sewer demand for proposed development

The sewer runoff is calculated as follow:

SEWER FLOW	
Average Dry Weather Flow (ADWF) (90% of annual average daily water demand)	2 160/d (0.025 l/s)
Peak Factor	4.0
Peak Dry Weather Flow (PDWF)	0.100l/s
Peak Wet Weather Flow (PWWF)	0.115 l/s

5.2 Availability of capacity on sewer reticulation network

It is proposed that sewerage is treated on site by means of an onsite package plant. The sewerage will be treated to DWS Special Limits and will be re-used on site for irrigation purposes and washing of the PV panels.

The alternative solution would be to store the sewerage in a conservancy tank and to have this emptied on a regular basis by a services provider.

6. Stormwater system

The Design Rainfall Estimator in South Africa (Version 3) was used to extrapolate rainfall data from the closest rainfall stations. The average mean annual precipitation from the six rainfall stations in close proximity to the site amounts to 628mm. This will be used in all hydrological calculations.

The site slopes from east to west at an average slope of 3.2%.

Due to the nature of the development, the catchment characteristics of the site will not be altered significantly. Besides general clearance and levelling, to allow for the ground mounted framework on a plinth, no other surface preparation will be completed. Run-off from the panels will discharge directly onto to the ground and the existing topography will be maintained. When these panels area washed, a biodegradable cleaning agent will be used, to prevent groundwater contamination.

Areas where there will be significant changes in catchment characteristics (such as buildings and substations) will be subject to additional treatment measures on the stormwater run-off. It is proposed that roof water is collected in 5000 litre Jo-Jo tanks at each downpipe position and that this water is reused on

site, either for irrigation purposes or cleaning of the PV panels. Each Jo-Jo tank will be fitted with an overflow pipe discharging onto a 1.5m x 1.5m x 600mm deep stone drain from where runoff will be able infiltrate and disperse.

In addition to the run-off from the roofs collected in the Jo-Jo tanks, an attenuation facility with a capacity of 127.80m³ will need to be provided to accommodate the increase in the stormwater run-off from the areas allocated to buildings [it is the intension to limit the post development run-off (RI 1:50) to those of predeveloped levels (RI 1:50)].

For the substation area an attenuation facility with a capacity of 726.80m³ will need to be provided to accommodate the increase in the stormwater run-off. The combined treatment capacity will therefor amount to 885m³. Refer to **Annexure A** for the position and layout of the proposed stormwater facility.

7. Road Network

Due to the large extent of the site two access points are proposed. Access will be of the R501 and at one location along Welterdiend Road. The existing roads are single carriage roads with gravel shoulders.

It is proposed that all internal roads are gravel and will range from 5.0m to 8.0m wide. Cut-off (earth) drains will be provided on either side of the road to accommodate drainage.

All internal roads to the proposed development must comply with the minimum specification as given in the "Red Book - Guidelines for Human Settlement Planning and Design" and the municipal standards from Merafong City Municipality.

8. Solid waste

It is proposed that solid waste is collected and stored at a designated area close to the entrance of the site. Arrangements will need to be made with a private services provider for the collection of the refuse.

9. Conclusion

From a water perspective it is proposed that groundwater is extracted to accommodate the domestic demand. Due to location of the site in proximity for existing services, it is proposed that the sewerage is treated by providing an onsite package plant. From the above it can be concluded that the solar facility can be accommodated.

We trust that the information provided will be sufficient for the purposes of the application.

All aspects of this report will be confirmed in the detail design stage of the project.

Please do not hesitate to contact the undersigned should you require any additional information.

Yours faithfully,



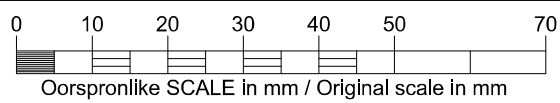
Compiled by:

Ruaan Siebrits (Pr Tech Eng)

Attachments:

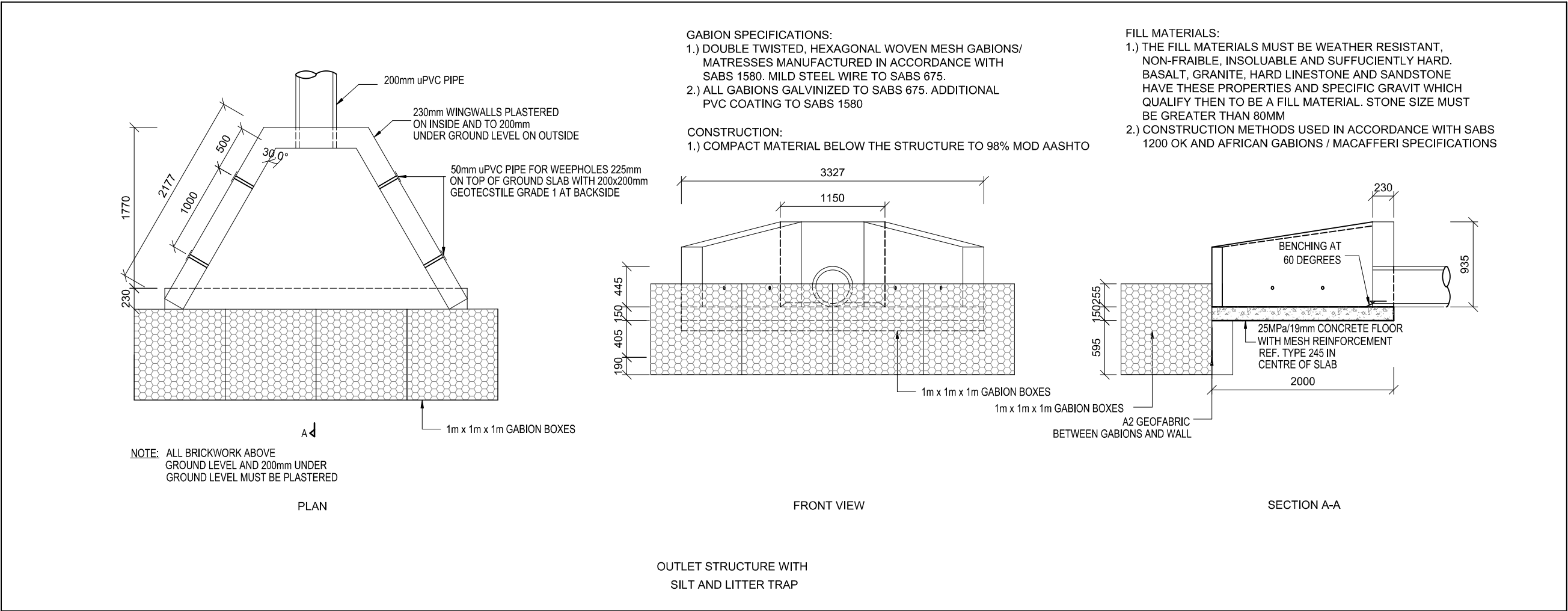
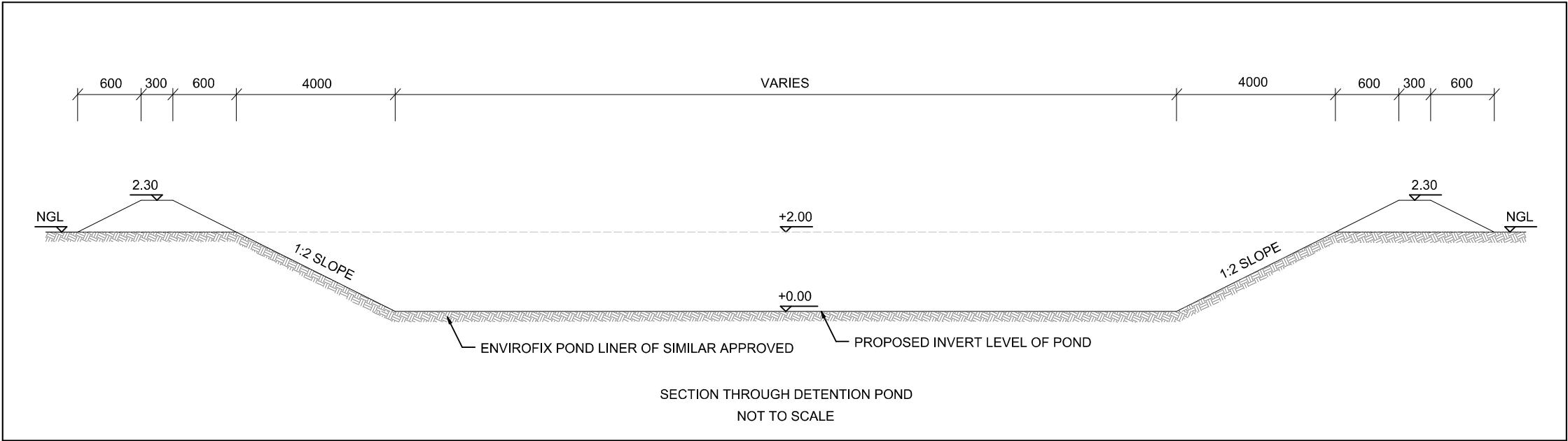
Annexure A – Stormwater Management Plan

ANNEXURE A



LEGEND FOR STORMWATER RETICULATION

PROPOSED	DESCRIPTION
	450mm CLASS 100D CONCRETE PIPE
	HEADWALL (INLET)
	SILT AND LITTER TRAP (OUTLET)
	RENO MATTRESS (3m x 1m x 0.3m)
	ATTENUATION POND



A	06/03/2024	FOR INFORMATION PURPOSES
Wysiging Amend.	Datum Date	Beskrywing - Description

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Opgemaat	NA	Ingenieur - Engineer
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Designed	RS	Kliënt - Client
Geteken	RS	Geteken Signed
Drawn	NA	Datum Date
Nagesien	NA	Datum Date
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**LEGACY ENVIRONMENTAL
MANAGEMENT CONSULTING**

Projek - Project

**PORTION 5 OF FARM
VARKENSLAAGTE NO 119,
CARLETONVILLE**

Planbeskrywing - Plan Description

**PROPOSED STORMWATER
MANAGEMENT PLAN**

Skaal - Scale
1:6 000 (A1)

Datum - Date
MARCH 2024

Plannommer - Plan number
UDS676/C/03

Wysiging Amendment	A								
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